

**THE  
EGYPTIANS**



**1965-66  
YEAR BOOK**

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## HISTORICAL SKETCH

The Egyptians, "a club for the discussion of scientific, religious, economic and other topics pertaining to the welfare, culture and happiness of the people," was organized at a meeting of fifteen men held in the home of the late A. S. Caldwell on June 21, 1913. These men had been meeting as an unorganized group since 1911. The fifteen founders were: Charles N. Burch, A. S. Caldwell, J. B. Cannon, Elias Gates, Charles J. Haase, E. M. Markham, C. P. J. Mooney, Sanford Morison, J. Craik Morris, A. B. Pittman, J. W. Rowlett, A. Y. Scott, Bolton Smith, B. F. Turner and J. C. Wilson.

Before the organization was completed, fifteen others were enrolled as charter members, namely: Albert W. Biggs, E. C. Ellett, W. H. Fineshriber, J. R. Flippin, Thomas F. Gailor, Marcus Haase, Herman Katz, James P. Kranz, Walter Malone, R. B. Maury, H. Dent Minor, A. E. Morgan, Israel Peres, Alfred H. Stone and Luke E. Wright.

The name chosen for the organization was proposed by W. H. Fineshriber. The fact that ancient Memphis was in Egypt suggested the name. The by-laws stated that the membership should "consist of not more than thirty-three men of recognized standing, ability and influence in Memphis and Shelby County, Tennessee." It was further stated that members were to present their contributions in the form of papers and that all papers were to be issued in printed form. This clause has resulted in the largest and most significant literary production of a general nature ever made by any group of Memphians.

From the beginning, The Egyptians were guarded against internal friction by a constitutional provision that "no resolution shall ever be passed committing the club as a body to any proposition." The club is unique in the unwritten law that its name is not to appear in the press in any connection.

## CONSTITUTION AND BY-LAWS

As Amended to May 31, 1960

### ARTICLE I.—Objects.

Section 1. The subscribers hereto associate themselves for the purpose of discussing, at stated times and in a social way, such topics as pertain to the welfare, culture and happiness of the people, particularly of our own locality, state or nation. No resolution shall ever be passed committing the club as a body to any proposition.

### ARTICLE II.—Name and Membership.

Section 1. This organization shall be known as THE EGYPTIANS, and shall consist of not more than thirty-three regular contributing members, who shall be citizens or residents of Shelby County, Tennessee, of recognized standing, ability and influence in the community, with other associates as provided in Section 2.

Section 2. Honorary membership may be tendered only to non-resident persons distinguished in the walks of education, literature, science or art; and such associates having no votes, shall be exempt from payment of all dues and assessments.

Section 3. Any member may nominate an individual for membership, submitting a brief statement of the candidate's qualifications to the officers of the club. If by majority vote of the officers, the candidate is acceptable, the officers shall circularize these qualifications to the members of the club at least one week prior to the following meeting. A secret ballot shall be cast by mail, with the minimum number of affirmative votes for election equalling at least two-thirds of the total membership, and if not more than two adverse votes be cast by the members, it shall be the duty of the secretary to invite such person to become a member.

### ARTICLE III.—Officers.

Section 1. The Officers of the club shall be a President, Vice-President and Secretary-Treasurer, each to be chosen by ballot at the last meeting in May, to serve one year, or until a successor shall be elected.

Section 2. As a compensation for his services, the Secretary-Treasurer shall be exempt from the payment of all dues, charges and assessments.



#### **ARTICLE IV.—Meetings.**

Section 1. Regular meetings of the club shall be held at 6:30 p.m., the third Thursday in each month, between October 1st, and June 1st, beginning the third Thursday in October, except as provided in Section 2.

Section 2. The club may, at any session, charge the date of a succeeding meeting, or the President, with reason therefor, may change the date of the next meeting or call a special meeting as may be required.

Section 3. In the event of change or call for special meeting, as provided in Section 2, the President shall direct the Secretary to notify members thereof.

Section 4. Any member who shall fail to attend at least three meetings during a season without excuse shall be conclusively presumed to have resigned and such implied resignation shall become effective without action of the club. He shall, however, be sent the publications of the club for the full period for which he has paid dues.

Section 5. The time consumed by any paper shall not exceed thirty minutes and in the discussion which follows, no member shall speak more than once and not exceeding ten minutes, until all other members present shall have had the opportunity of speaking.

#### **ARTICLE V.—Dues and Assessments.**

Section 1. The annual dues shall be nine dollars and ninety cents, payable in advance, provided that a member admitted after February 1st shall be required to pay only one half the annual dues for the balance of the year

Section 2. A special assessment, if necessity arises, may be levied at any regular meeting by an affirmative vote of a majority of all the members of the club.

Section 3. Failure to pay dues or assessments within sixty days of notice shall be considered as forfeit of membership.

#### **ARTICLE VI.—Quorum.**

Section 1. Eight members shall constitute a quorum for the transaction of business.

#### **ARTICLE VII.—Amendments.**

Section 1. This Constitution and By-Laws may be amended at any regular meeting, provided the proposed change has been announced at the previous meeting and is adopted by an affirmative vote of a majority of those present; and provided, that not less than eight affirmative votes shall be necessary.

Section 2. Article II may be altered or amended only at the annual meeting (last meeting in May), previous notice of proposed change having been given.

#### **ARTICLE VIII.—Papers.**

Section 1. Any member of the club who shall fail to present a paper or deliver an address on the date assigned him, without an excuse that shall be satisfactory to the Officers, shall thereupon forfeit his membership. The Secretary shall give each member, to whom a paper or address is assigned, at least three months notice of the date assigned to such member. The subject of any paper or address shall be selected by the writer with the advice of the Officers and the Secretary shall announce topics for discussion not less than two months in advance.

#### **Addendum.**

On January 10, 1922, the following rule was, on motion, unanimously adopted and recorded: That out of town guests brought by members of the club be welcome; That members introducing guests who are residents of Memphis, be charged \$2.25 (or such an amount as shall be determined from year to year) per meeting for each guest.

# THE EGYPTIANS

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## OFFICERS AND MEMBERS

1965-66

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### Officers

Walter P. Armstrong, Jr. .... President  
Francis G. Hickman ..... Vice-President  
Edward F. Thompson ..... Secretary-Treasurer

### Honorary Member

Rabbi W. H. Fineshriber

### Members

Otto H. Alderks	McDonald K. Horne, Jr.,
John David Alexander	Ed Lipscomb
Walter P. Armstrong, Jr.	Arthur W. McCain
S. J. Buckman	John F. Moloney
Lucius E. Burch, Jr.	Clark Porteous
W. J. Michael Cody	Peyton N. Rhodes
John E. Farrior	Rudi E. Scheidt
Frank Faux	Elder L. Shearon, Jr.
Hubert Garrecht	Dr. Newton S. Stern
Dr. Henry B. Gotten	Dr. Thomas N. Stern
A. Arthur Halle, Jr.	Edward F. Thompson
Francis G. Hickman	John H. Todd
Dr. T. S. Hill	Thomas F. Turley
Ralph C. Hon	C. Lamar Wallis
McDonald K. Horne	C. B. Weiss

# MARK TWAIN: PARADOX

FRANK E. FAUX

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Read Before "THE EGYPTIANS," October 21, 1965

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"Everyone is a moon and has a dark side which he never shows to anybody," wrote Mark Twain in the early years of his physical and mental decline. Without speculating on the truth of such a statement, universal truth, that is, it provides an excellent description from which to evaluate Twain, himself. Yet, one must wonder if he was not again trying to use humor to offset the increasing frustration and bitterness that possessed him only a few years after the writing of his greatest book. There were indications of the change within him in his writings prior to those recently released for publication, and his daughter, Clara, was long hesitant to permit us to view the most violent changes that took place. She fought a gallant fight to keep her father, her religion, her friends and herself from the deep embarrassment subsequent to the release of the heretofore secret writings.

And then, strange as it may seem, the last and most violent of his writings received surprisingly little comment in the public press. Religious leaders were asked for their comments, but few replied, some in an apologetic manner. I think the indifferent manner in which they were received may have been an indication of a rather general agreement with what he had to say about religious doubts, but with them I was not particularly concerned. But, I was sorely wounded to learn of the utter collapse of one who had been given so much of my admiration and respect. What I say tonight contains very much of me.

Mark Twain died 55 years ago this past Spring. In a world that is really too busy to mourn its illustrious dead until 100 or more years have passed, I am mindful that I may be rushing things here tonight. Yet, 55 years is a long time, but the appearance of heretofore unpublished writings make him currently present with and among us.



Only a year ago was his estate, valued at \$750,000, officially closed. Only a year ago were published his writings titled "Reflections on Religion." It has been less than three years since we were given "Letters from the Earth" and "The Damned Human Race," and only thirteen years since we received "The Letters from the Recording Angel" and "Captain Stormfield's Visit to Heaven." So, he is still very much with us.

If you have not read the titles mentioned, you know they must deal with his spiritual and religious beliefs or disbeliefs. Long suppressed by the family, they are now available to the public. "Reflections on Religion" are not yet in book form, but "Letters from the Earth" and "The Damned Human Race" are. If you are thinking of purchasing the latter two, be warned they contain much that has previously appeared elsewhere. You will understand why as you recall the student at the University of Virginia, deeply immersed in philosophical research and intense longing for the meaningful, asking William Faulkner why "The Sound and the Fury" and "As I Lay Dying" were published in the same volume, only to learn that the publisher thought that together they constituted enough pages to sell at a proposed price.

I am opposed to censorship in any form. I think we readers are entitled to know all, be it worthy or not, and then create our own censorship without benefit of politicians, custodians, or even relatives. I found "Letters from the Recording Angel" and "Captain Stormfield's Visit to Heaven" most delightful. In light of them, I could not understand the delay in the publication of other writings, nor could I imagine what Clara considered to be unpublishable. After years of impatient waiting, now I know. My mind is unchanged, but my heart is saddened. Twain did not know how truly he spoke of himself when he once said, "we are always more anxious to be distinguished for a talent which we do not possess than to be praised for the fifteen which we do possess."

At the age of fifteen, my Dad had the opportunity to read "The Adventures of Tom Sawyer" and those of Huckleberry Finn. In due time, he could recommend them to me, and by now four generations in my family have lived joyous lives in Hannibal, and three generations have actually been there, absorbing the river, the caves and the catfish. I often wonder,

though, how many sharing those experiences have shaken off the glories of the wonderful story-telling to squarely face the deeply imbedded social and religious issues around which the stories are woven. So it is that too many of us retain our childish delights in an "Alice in Wonderland," or a "Gulliver's Travels," or a Huck Finn, and miss entirely the true message of the writer. I mention Huck Finn in this connection because I consider it Twain's finest novel—too often remembered for the exciting trip down the river on a raft, or for the hair-raising nights on a deserted island. Too often forgotten is the portrayal of the human effort to escape the economic, social and religious conventions so easily made sacrosanct by an unthinking culture to the denial of a person's liberty and freedom. I recall that I laughed in derision on learning that the library in Concord, Massachusetts, had banned Huck Finn shortly after publication; now, I tremble with fear as I learn of the hundreds of school libraries currently banning it for the foolish reason that one of the characters was called Nigger Jim—a character even more noble than Huck and one who, like Dilsey, will endure.

It seems that every era contributes galaxies of literary brilliance in varying degrees. The close of the first world war brought us Vincent Sheean, Webb Miller, Negley Farsons and Pierre van Paassen, not liking what they had experienced, but believing that mankind could rise above itself while honestly and earnestly evaluating its own possibilities. The Roaring Twenties gave us the Fitzgeralds and the Lewises, who so accurately pictured their era that they fell victims to their own artistry. The depression of the thirties pinpointed the effects of writers drowned in the hopeless sea of economic determinism. The war of the forties influenced our writers towards pessimism and by the fifties pessimistic confusion was so rampant that our writers frantically clutched Freud to their bosoms and no longer tell a story, but rather do they bore us with their self-analyses.

Doubly blessed was America in the Mark Twain era! Two literary galaxies of especial brilliance spread across its heavens—the Transcendentalists bringing to fruition the Flowering of New England, and Twain and his compatriots creating a new physical and literary frontier in the west. He was one of, and,



no doubt, the greatest of that glorious company made up of Artemus Ward, Josh Billings, Bill Nye, Ambrose Bierce, Eugene Fields, James Whitcomb Riley and Petroleum Nasby. They wrote and spoke in different manners as they pictured the growing and scornful West. They punctured the bubbles accruing from the foibles and the fables of a so successful dollar and power economy that it had convinced itself it was fulfilling a manifest destiny given it by God, Himself. Bernard Shaw once wrote to Twain, "I am persuaded that the future historian of American will find your works as indispensable to him as a French historian finds the political tracts of Voltaire." Historians are now viewing that era through the eyes of Mark Twain.

What a man he was! And what a paradox! Few Americans have received the world-wide acclaim given to him; few Americans have received such world-wide criticism. Born in poverty, given little education, and obsessed with dreams of a Calvinistic hell, he was able to leave Hannibal and hell behind him to travel, to write and to secure a river pilot's license, with its corresponding high wages. The outbreak of the Civil War closed the Mississippi to public traffic, and with great enthusiasm he joined a group of Confederate militia. Two weeks later, the militia broke up due to the lack of discipline and ability. Undaunted, he enthusiastically joined his Unionist brother, who had been appointed Secretary of the Territory of Nevada, on the trek westward. There, the mining fever struck him to no financial avail and he returned to humorous journalism which was to give him the riches he wanted so much. The get-rich-quick fever never left him and he was always a soft touch for gold bricks and dazzling inventions—among them a steam pulley, a cash register, an engraving process, a spiral hat pin, and a typesetting machine—none of which worked.

As someone pointed out, "Mark Twain is a very eccentric creation of Mr. Clemens." Between them—or together—we find "the romantic and the realist, the cynic and the sentimentalist, the comic and the tragedian, the optimist and the pessimist, the dreamer and the vulgarian, the speculator and the altruist, the plebian and the aristocrat." In his review of Twain's "Innocents Abroad," Bret Harte wrote, "Like all materialists, Twain is an honest hater of all cant—except, of course, the

cant of materialism—which, it is presumed, is perfectly right and proper." Twain considered that statement a most valid reason to hate Harte the rest of his life. On the other hand, Twain could say, "When the Lord finished the world, he pronounced it good. That is what I said about my first work, too. But Time takes the confidence out of these early opinions. The fact is, there is too much water in both."

Despite all the handicaps of his youth, Twain made a rather glorious life for himself—at least, up to his closing years. He saw what was taking place in the country and in the world. In my opinion, he correctly analyzed the forces at work, and he spoke out in no uncertain terms. He did not shut his eyes to the ugly truths of the economic and political systems of his day. He exposed congressional corruption; he fought the rising powers of the Carnegies and Rockefellers and Goulds and Vanderbilts. He denounced our entry into the war with Spain, our cruelties in the Boxer Rebellion, and the conquest of the Philippines. Under the ironic title of "A Defence for General Funston," he scored the treachery employed by Funston in the capture of Aguinaldo, and the Judas Iscariot role played by our government in the betrayal of a friend in order to advance what was definitely a growing Yankee imperialism. He helped defeat Boss Tweed and Tammany Hall. His "The Gilded Age" was the prime medium for all these castigations. One wonders what he would say and write were he with us today. I think one thing to be certain—were he writing today he would each year be called up before the House Un-American Activities Committee. He was an irreverent satirist and a disturbing equalitarian, but more a debunker than a constructive thinker. That is not an unfavorable criticism for the debunker fills a great need. He had trouble with the realm of ideas and found it necessary to call on Tom to finish Huck's story.

Emerson and Twain were as unlike as any two persons could be, but they had one thing in common and that was the desire for a self-reliant America. But how different were their approaches! Twain issued another ringing Declaration of Independence through his "Innocents Abroad." To him, the desire of so many from a young America to see and pay homage to the art and music of the old European masters was nonsense. The elevation of kings and queens and princes and princesses



during a Cotton Carnival or a Mardi Gras or an Ak-Sar-Ben was more than damn foolishness, it was downright treasonable. Titian, Giotto, Wagner were just men, and not one whit better than an American. A man named Bacon wrote Shakespeare. Twain saw no reason why we should spend our time and our money to oh and ah at dirty, faded and worn-out paintings, broken sculpture, and fallen architecture in the old world. He thought Lohengrin a lot of baloney—my term, not his—and he rejoiced greatly when Bill Nye said he had been told that Wagner's music was better than it sounded. This was all a part of his nature, of course. He could not resist criticizing the sacred cows, be they sacred in fact, or only in fancy. We are told that after seeing the production of "King Lear" all he remembered about the performance was the lightning and thunder. There was no tune equal to "Die Lorelei."

Thanks to Hemingway—who said all great American fiction began with Huck Finn—and the Hemingway disciples, we have learned to measure the greatness of an author by his telling of his sexual exploits, either real or fancied. Some modern critics are viewing Twain in that light and find him lacking true greatness. After all, say they, the record is quite clear. He waited until he was 35 years of age to marry, and then took a semi-invalid for wife. Tom Sawyer called on Becky one time when she was gazing at a nude form pictured in a medical book, but the incident was deleted from the original script. Joan of Arc, virginity personified, was his foremost heroine. Only in "Pudd'nhead Wilson," in the role of Roxana and through the medium of miscegenation did he portray a passion that might not be discussed in the parlor. After Hemingway and Miller have put us straight in regard to manhood, Twain must have been a reincarnation of Sir Galahad—or else, impotent, maybe even queer. The fact that he fathered four children must somehow be incidental. Yet, hold onto your hat! The paradox of Mark Twain is ever present, for in "Letters from the Earth" and "Reflections on Religion" he went overboard; at times, making Hemingway and Miller look like pikers.

As I have said, "Captain Stormfield's Visit to Heaven" had whetted my appetite for more of the unpublished writings. I knew they contained more of Twain's religious ideas and I am interested in such ideas. While reading the newly published

works, I suppose I went into a state of shock, not from what he said, but that his intelligence would permit him to say it.

Seemingly, it never occurred to him that The Bible could be a history of a people's spiritual evolution, containing both the good and the bad; or that it contained more than the first five books. I want to think he knew he was out of bounds intellectually at times, for he marked some of the writings "publish 100 years after my death," and others "500 years after my death." He could have destroyed them, but we are told he saved everything he had written, even the passages of which Livy disapproved and which were torn up in her presence. What sort of an emotional imbalance forced him to write them and preserve them? How could this often gentle and righteous man be so violent, so intolerant, yes, so stupid? He now held a membership card in the damned human race.

After years of wealth and adulations, Twain lost his wealth, his wife and two daughters—all in a span of a few years. Through some force, or quality, he felt it imperative to pay all his debts, and he lectured and wrote to pay them. Something fortified him to accomplish that, but he had nothing to sustain him in his grief. A religion in which "deep calleth unto deep" he did not possess. He had blackened the character of God, found the Bible to be an influence for evil, and knew that the present God and the present religion were only temporary and could not endure. He had nothing to take their places, so he succumbed to his grief and disappointment and frustration, and wrote his later and most bitter works: "The Man That Corrupted Hadleyburg"; "What Is Man"; "Mysterious Stranger" and "Reflections on Religion"—all the time damning God and damning man.

It was not always so. True, he did not believe in the immaculate conception—in fact, he did not seem to know the difference between it and virgin birth—he did not think Christ had proven He was God; he had rejected Christianity, but had made relatively little point of it. True, he early called mankind the damned human race, but in an ironic or satirical gentleness as would a loving father rebuking an errant child. He stated that "in religion and politics people's beliefs and convictions are in almost every case gotten at second hand, and without examination, from authorities who themselves have



not examined the questions at issue but have taken them at second hand from other non-examiners, whose opinions about them were not worth a brass farthing." Nothing new, startling, nor untrue about that—Plato had said it over 2,000 years before. At another time, he said, "I believe that our Heavenly Father invented man because he was disappointed in the monkey." Others could have said that before him. Twain even had a creed, one which his several editors tell us was never changed over the years. It reads:

I believe in God the Almighty.

I do not believe He ever sent a message to man by anybody, or delivered one to him by word of mouth, or made Himself visible to mortal eyes at any time in any place.

I believe that the Old and New Testament were imagined and written by man, and that no line in them was authorized by God, much less inspired by Him.

I do not believe in special providences. I believe that the universe is governed by strict and immutable laws. If one man's family is swept away by a pestilence and another's is spared it is only the law working: God is not interfering in that small matter, either against the one man or in favor of the other.

I believe that the world's moral laws are the outcome of the world's experience. It needed no God to come down out of heaven to tell men that murder and theft and other immoralities were bad, both for the individual who commits them and for society which suffers from them.

If I break all these moral laws, I cannot see how I injure God by it, for He is beyond the reach of injury by me—I could as easily injure a planet by throwing mud at it.

His creed was rather negative and not too profound, but many good men have held similar creeds before and since. In this humanistic, this secularized age we cannot fault him on that score. When the chips were down, however, his creed was not enough. He had been able to shake the Calvinistic hell, but he could not ignore the Calvinistic guilt. When his favorite

Susy died while he was lecturing abroad, God may have not been interfering in that small matter, but the newly published papers unfold his bitter and savage reflections about God giving us breath and bodies only to cause us grief and death through a million plagues of disease. Livy becomes a hopeless cripple, Jean is discovered to be an incurable epileptic, Mark, himself, is in crumbling health and is losing his creative powers. Why? Why? Was I to blame for something I did or did not, he asked. I *am* being punished, and punishment is preceded by guilt. His reflections do not take us back to his creed, you see. If the universe, of which he was a part, is governed by strict and immutable laws, do not those laws provide for sickness and old age and death? If so, and there is nought beyond the grave—as he believed—why be concerned with a guilt feeling? Or is that also a part of those strict and immutable laws? Twain could ridicule a belief in an after-life as a relief from this world's suffering, but listen to him in his old age: "Whoever has lived long enough to find out what life is, knows how deep a debt of gratitude we owe to Adam, the first great benefactor of our race. He brought death into the world." Since he brought Adam into this picture, one might ask but why did Adam die, and how about those strict and immutable laws?

The blessings of death occupy more and more space in his later writings. "The Mysterious Stranger" tells the boy, Theodore, "It is true, that which I have revealed to you; there is no God, no universe, no human race, no earthly life, no heaven, no hell. It is all a dream—a grotesque and foolish dream. Nothing exists but you. And you are but a thought—a vagrant thought, a useless thought, a homeless thought, wandering forlorn among the empty eternities." Something could be said about that, but why disturb the peace of death? Instead I bring you the sympathetic words of Dixon Wecter on the passage: "And in his heart of hearts the boy knows this is true. Here, in the closing pages, Mark Twain solved his riddle of grief and self-reproach, and clothed his soul in the only invulnerable armor of desperation. Good and evil, like reality itself, are only illusions, such stuff as dreams are made on, and our little life is rounded with the best gift of the Artist who saves it to the last—extinction."



I shall continue to oppose censorship in any form; I shall continue to want to learn all I can about great men; I shall continue to read what they have written, even though I read through tears of disappointment and regret. I have reached the age where I can choose many happy memories to which I can cling; and I have chosen Huck and Nigger Jim. That they were children—the one in body, the other in mind—is rather important to my choosing for I happen to believe that of such IS the kingdom of heaven. Somewhere in the paradox that was Mark Twain I hope he made other, and more significant, choices. Declining an invitation to attend a celebration in California, he wrote: "If I were a few years younger, I would accept. I would let someone else do the oration . . . I would talk—just talk. I would renew my youth and have the time of my life. Those were the days!—those old ones. They will come no more; youth will come no more; they were so full to the brim with the wine of life, it chokes me to think of them. Would you like me to come out there and cry? It would not beseem my white head. Good by—I drink to you all. Have a good time—and take an old man's blessing." That warm, affectionate, nostalgic message was written in the depth of his pessimistic eclipse. How can we account for it *and* the damned human race?

Probably the most human of all man's traits is that of projecting himself upon the universe. Born as the light of Halley's comet filled the sky, he insisted he came into the world with the comet and would go out with it. As he died 75 years later, the light of the same comet so dazzled the skies that one could suppose all heaven was rejoicing. I draw no comparisons, but am reminded by the foregoing phrase that in his "Letter from the Recording Angel" to the coal dealer in Buffalo, we read, "And Abraham, weeping, shook out the contents of his bosom and pasted the eloquent label there, RESERVED; and Peter, weeping, said, 'He shall be received with a torchlight procession when he comes:' and then all heaven boomed, and was glad you were going there. And so was hell." His projection took form, however, as the misfortunes of old age, bankruptcy, overwork, and deaths in the family were focused into a final recognition of life's essential darkness. He wrote to Howells that man was not "really fit for anything but to be stood up on the street corner as a convenience for dogs." Man was not

good, nor did he progress. "Every human is in his own person the whole human race, with not a single detail lacking," he told his journal. "The human race is a race of cowards and I am not only marching in that procession but carrying a banner." Thus did he send forth his projection from his guilt, his remorse, his avarice and his weakness. As I wear my sackcloth and ashes I am reminded that Job told a similar story and told it better.

"In this country," Twain once said, "we have three inestimable blessings—freedom of thought, freedom of expression, and the prudence never to indulge either of them." Ah, good friend, why did you not remember?

#### Chronology

- 1835—Samuel Langhorne Clemens born
- 1865—The Celebrated Jumping Frog of Calaveras County
- 1869—Innocents Abroad
- 1870—Married to Olivia Langdon
- 1873—The Gilded Age
- 1875—Sketches
- 1876—Adventures of Tom Sawyer
- 1879—Tramp Abroad
- 1880—Prince and the Pauper
- 1883—Life on the Mississippi
- 1884—Adventures of Huckleberry Finn
- 1889—Connecticut Yankee in King Arthur's Court
- 1893—Bankrupt
- 1894—Tragedy of Pudd'nhead Wilson
- 1896—Joan of Arc
- 1896—Susy died
- 1899—The Man that Corrupted Hadleyburg
- 1904—Livy died
- 1906—What is Man
- 1909—Jean died
- 1910—Mark died
- 1916—Mysterious Stranger
- 1952—Letters from the Recording Angel
- 1952—Captain Stormfield's Visit to Heaven
- 1962—Letters from the Earth
- 1962—The Damned Human Race
- 1964—Reflections on Religion

## OLD SOUTHERN HUMOR AND WILLIAM FAULKNER

JOHN E. FARRIOR

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*Read Before "THE EGYPTIANS,"* November 18, 1965  
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At about the time that the great movement of American Romanticism was developing in New England and the Middle States, there was another literary movement developing in the South. In the North, Irving, Poe, and Hawthorne were developing the loosely constructed tale into the tight, closely-knit short story. Bryant, Poe, and Emerson were developing poetry into an art that would be respected at home and abroad. Cooper, Hawthorne, and Melville were writing the first real novels which would remain as classics in American literature.

In the South there were few if any writers who would achieve lasting distinction in the essay, the short story, or in poetry. There was only one major novelist, William Gilmore Simms of Charleston, and even he was seldom accorded the critical acclaim that was heaped on Northern writers.

There was one field, however, in which Southern writers were to excel in the amount of writing, the number of writers contributing, and the genuine native quality of the product: this was the field of native, folk humor. Nearly all the writing in this genre consisted of tales of varying length, some mere anecdotes, and some rather lengthy tales that might run as much as twelve or fifteen pages. They were written by men of various professions, lawyers, doctors, planters, newspaper men, some even by governors and congressmen. Invariably the writer was an educated gentleman who felt his superiority to the natives whom he depicted, but found their antics, their language and their general philosophy so interesting and amusing that he felt impelled to write about them.

They were rarely if ever professional writers. They were merely private gentlemen who wanted to do a little writing, to share their experiences with friends or with the general public. Quite a number published collections of their sketches, but this sort of writing did not receive much attention from serious critics because it dealt with such common people and incidents that it was considered subliterary and hardly worth while.



Most of this writing concerned people living in the old Southwest, that area lying west of the Carolinas and Georgia and extending beyond the Mississippi to include Arkansas and rural Louisiana. Much was going on in this region from 1830 to 1860. Before the beginning of the century, sturdy pioneers, often of Scotch, Irish, and German stock had pushed over the mountains and had spread into the territories of what were to be the future states. Though many were uneducated, they were bold, self-reliant men, able and ready to meet any emergency. When the Indians were sent out of the area by Jackson in 1836, a great land rush began, especially into Alabama and Mississippi. Opportunists of all kinds came in floods, and the "flush times" that Joseph Glover Baldwin was to write about were in full swing. Solid planters, young lawyers seeking clients in a country where much litigation was sure to develop, tradesmen, artisans of all kinds, gamblers, landgrabbers, and shady characters whose survival sometimes depended on their quickness with a knife or a gun, flooded the whole area. In spite of the fact that considerable towns with enlightened and cultured people had grown up in various places, much of the area was still in the pioneer stage.

For the writer viewing the scene there was no lack of character types and no lack of eventful action for subject matter. Invariably the writers dealt with lower class or lower middle class people. Usually, the writer began and ended the story by speaking in his own person, using his own correct speech, but this was merely a device which allowed him to bring in his characters who speak in dialect, often using very rich, poetic figures of speech, and sometimes using very coarse or profane expressions. Their similes and metaphors are full of novelty. In its long history, no one had ever given the English language such a workout as it was given then.

There was an infinite variety in the material for the stories. There was stories of the hunt, of fights and mock-fights, of militia drills, of courtings and weddings and frolics and dances, of games and horse races, of trades and swindles, of the country boy in the city and the city slicker in the country; particularly, there were the practical joke and the contest. Almost always, the main character in a story is in contest with another man, whether in a fight, a courtship, a practical joke, or a financial deal. This eternal competition leads naturally to the tall tale

and the capping of one tall tale by another. Although many of the tales are what I like to call "ventures into the totally improbable," as are many of the Mike Fink and Davy Crockett tales, there is much more also.

No complete collection of these tales exists. Recently Houghton Mifflin of Boston put out a volume featuring 24 authors,<sup>1</sup> but these are only a part. In this paper I intend to give only brief samplings of a few authors.

This type of tale seems to have started in somewhat straightforward anecdotes about actual individuals. The two who most readily come to mind are Mike Fink and Davy Crockett, one a keelboat man and plainsman and the other a hunter and politician. In 1828 there appeared a story "The Last of the Boatmen," by Morgan Neville. Actually, the story is a brief biography of Fink. He had been a keelboat man who could outwork, outshoot, and outfight every other keelboat man. When the steamboat came onto the rivers, Fink left in disgust and became a trapper and hunter in the west. Later in a shooting match he attempted to shoot a tin cup off a friend's head, but being too drunk he shot the friend through the brain and was in turn shot by a friend of the dead man. Crockett was a very self-reliant man who left home at 13 to be independent and make his way in a hard and difficult world. He went with Jackson to the Creek War and was a good soldier. He went to the legislature two terms and was elected to Congress three times.

Both of these men had the pioneer virtues of physical strength and endurance, were marvelous shots with the rifle, and had the ability to win in every fight they got into. Myths grew up about them while they were alive, but after they were dead the myths were expanded to almost incredible proportions. Both had the half-horse, half-alligator legend tied to them.

So far as I know, Mike Fink never wrote anything, even a letter; thus all his legend has been manufactured by others. Crockett, however, helped to make his own legend. At least five books about Crockett or purporting to be by him were published by 1836, the year of his death.<sup>2</sup>

In Crockett's own writings he may stretch the truth a bit, but

<sup>1</sup>Hennig Cohen and William B. Dillingham, *Humor of the Old Southwest*. Boston: Houghton Mifflin Company, 1964.



most of his narrative is straightforward reporting of his own actions and ideas at various periods of his life. But in those in which he had no hand he is exalted into a demigod, a sort of combination of Hercules and Samson blended into a shrewd backwoodsman. In the *Crockett Almanac* we find such tales as Davy's buying a quart of rum to treat voters six times with the same coon skin. After he had purchased the first quart, the rum seller tossed the skin under his counter where it showed between the logs so that each subsequent time that Crockett came up to buy rum he retrieved the skin and paid with it. There is also the story of the raccoon in the tree that he started to shoot. When he raised his gun, the raccoon raised his paw to halt him and the following conversation took place:

"Are you Davy Crockett?"

"Yes, I am."

"Then don't shoot. I'll come down."

The raccoon was, of course, allowed to retire with Davy's blessing. The *Crockett Almanac* also contains an account of the shooting match between Davy and Mike Fink. Davy shoots the tail off an old sow at considerable distance. Mike shoots the tails off the pigs. One tail is left a trifle long, and Davy trims that. Finally, Mike sees his wife about a hundred yards away and shoots a comb out of her hair. This is too much for Davy; he cannot shoot near a handsome woman. Mike wins the match.

Tales about Crockett and Fink were printed in newspapers, weekly magazines, and eventually in some of the monthly magazines before they were printed in book form. The copyright law was not regarded seriously in the 1830's and 40's, and editors did not hesitate to borrow from other papers or periodicals. One story might be reprinted a dozen times in several sorts of papers or magazines.

Along with the Crockett and Fink tales were many others which may or may not have been drawn from life. The pro-

<sup>2</sup>These volumes were: *A Narrative of the Life of David Crockett* (1834); *Sketches and Eccentricities of Colonel David Crockett* (1833); *An Account of Colonel Crockett's Tour to the North and Down East* (1835); *The Life of Martin Van Buren* (1835); and *Colonel Crockett's Exploits and Adventures in Texas* (1836). Crockett may have written the first, and he certainly furnished some material for the second because it was a campaign biography published when he was first running for congress. A *Crockett Almanac* was published from 1835 to 1856.

tagonists in these tales were purely creations of the author. One of the earliest writers of these was Augustus Baldwin Longstreet of Georgia. As a young attorney, he began to write a series of tales about Georgia characters in 1827 and published *Georgia Scenes* in 1835. Later, Longstreet became a Methodist minister and then an educator, being president of the University of Mississippi from 1849 to 1856 and president of the University of South Carolina from 1857 to 1865.

Longstreet's tales must be read to be appreciated. Some of the stories are not funny at all because they portray such crudity, ugliness, and violence, but usually there is a comic element. In "The Fight" the two pugilistic champions of the north and south divisions of the country Billy Stallings and Bob Durham, do not wish to fight each other. Each is content to rule his own domain. But their wives meet in a store and demand to be waited on at the same time. Mrs. Stallings calls Mrs. Durham "hussy," and she retaliates with a worse name. Billy comes in and, overhearing, calls Mrs. Durham "a sassy heifer." This brings on a fight between the two champions in a large ring with all the town as spectators. The fight is a very bloody, violent affair, with much hitting, wrestling and biting. Durham loses his left ear, a piece of his right cheek, and the middle finger of his left hand, all bitten off. Stallings has his nose half bitten off. Finally, Durham wins the fight, Stallings giving up rather than lose his eye-sight.

More amusing and less violent are the stories by William Tappan Thompson, a Philadelphian who came south, became a close friend of Longstreet, and worked as assistant editor or editor of several publications in Augusta, Georgia. While editor of the *Family Companion and Ladies Mirror* in 1842 he began publishing a series of stories later collected and published as *Major Jones' Courtship*. Major Jones is a bashful country squire, very much in love with Mary Stallions, but is very much in awe of her, her two older sisters and her mother. He goes to call just before Christmas. Mary wants to know what he is going to give her. He tells her if she will agree to keep what he gives her all her life he will give her a present, and tells her to hang up a big bag on the porch. Late at night he comes and gets into the bag, but is much bothered by the dog: "Bimeby the cussed old dog come up on the porch and begun to smell bout the bag. 'Git out!' ses I, very low, for fear they



would hear me. 'Bow! wow! wow!' ses he. 'Be gone! you bominable fool,' ses I, and I felt all over in spots, for I spected every minit he'd nip me, and what made it worse, I didn't know where he'd take hold."<sup>3</sup>

Besides the uneasiness about the dog, the Major suffers considerably from the cold, but morning finally comes. The family come out to see, the bag is lowered, and the Major tumbles out. Mary blushes scarlet, but agrees to keep her present, while her sisters say that they will hang up the bag again in hopes of getting husbands.

Quite different from these are the tales of Thomas Bangs Thorpe, a Massachusetts man who came south to live in Baton Rouge, painted portraits, wrote sketches, edited newspapers, and did numerous other things in the South. He started publishing sketches about the South in 1839. These were collected into a book, *The Mysteries of the Backwoods; or Sketches of the Southwest*.

Thorpe's most famous story is "The Big Bear of Arkansas." There is a unique quality in this story that sets it aside from most of the type. The writer is on a boat from New Orleans when he meets the Arkansan who tells the tale, a large-minded individual gifted with flamboyant rhetoric and no bashfulness at all. Someone talks to him about hunting, and he says that he never bothers with birds but did kill one forty-pound turkey. When asked where this happened, he answers:

"Happen! happened in Arkansaw: where else could it have happened, but in the creation State, the finishing-up country—a State where the *sile* runs down to the center of the 'arth, and government gives you a title to every inch of it? Then its airs—just breathe them, and they will make you snort like a horse. It's a State without a fault, it is."<sup>4</sup>

Some one answers that there *are* very large mosquitoes in Arkansas. He admits this but is of the opinion that they bother nobody but yankees. He goes on to add:

"But mosquitoes is natur, and I never find fault with her. If they ar large, Arkansaw is large, her varmints ar large, her

<sup>3</sup>William Tappan Thompson, "Major Jones Pops the Question," *Humor of the Old Southwest*. Ed. By Hennig Cohen and William B. Dillingham. Boston: Houghton Mifflin Press, 1964. P. 124.

trees ar large, her rivers ar large, and a small mosquito would be of no more use in Arkansaw than preaching in a canebrake."<sup>5</sup>

He is a great hunter of bears and has killed so many that the matter has become commonplace. But he discovered one great bear that out-topped them all. He first sees his marks on a sassafrass tree a full eight inches above those of any other bear. Then he sees his tracks and decides that he is *the* bear. It is here that the bear begins to assume the dimensions of the supernatural. With his dogs the hunter chases the bear time after time, but can never catch him. Once he chases him onto an island and is certain that he will kill him. He fires, the bear and dogs jump into the lake, and his favorite dog, Bowieknife, goes down with the bear. He snatches out his knife and is ready to dive after them when the dog comes to the surface. The bear does not come up. He finally gets a grapevine tied to one of the bear's feet and drags him ashore, only to learn that he has killed a she-bear and the big one has escaped him again.

Then, the narrator decides that he must kill the bear or leave Arkansaw in disgrace. He makes elaborate preparations and starts out on the hunt. He has hardly left his clearing when the big bear appears and walks toward him. He kills him with one shot. The bear is so big that it takes five Negroes to load him on a mule, and when he is skinned the hide will cover a bed and hang down several feet on each side. But the hunter was not at ease about the matter:

"But, stranger, I never liked the way I hunted him and *missed him*. There is something curious about it, that I never could understand,—and I never was satisfied at his giving in *so easy at last*. . . . My private opinion is, that the bear was an *un-huntable bear, and died when his time come*."<sup>6</sup>

This bear is not just a bear: he is *the* bear, the primary bear, the god bear of the Indians. This is the only instance I know of where the mythology of the Indians overlaps with the frontier tale.

Perhaps the best known today of all writers of old southwest humor is George Washington Harris who wrote the Sut

<sup>4</sup>Thomas Bangs Thorpe, "The Big Bear of Arkansas," *Humor of the Old Southwest*. Boston: Houghton Mifflin Co., 1964. P. 270.

<sup>5</sup>*Ibid.*, p. 271.

<sup>6</sup>*Ibid.*, p. 279.



Lovingood tales. Harris was born in Pittsburgh in 1814 but grew up in Knoxville, Tennessee. As a boy he became well acquainted with the East Tennessee mountain people and observed particularly the ludicrous, the pathetic, and the grim elements in their lives. Harris wrote most of the tales about Sut in the 1840's and 50's. They were later collected into a book which was reviewed by Mark Twain. Sut is a long, lean specimen who defines himself as a "natural-born dern fool." In one of the stories he lists his strong points:

"*Fustly*, that I haint got nara a soul, nuffin but a whisky proof gizzard, sorta like the wust half ove a ole par ove saddil bags. *Secondly*, that I'se too durn'd a fool tu cum even onder millertary lor. *Thudly*, that I hes the longes' par ove laigs ever hung to eny carkus, ceptin only ove a granddaddy spider, an' kin beat *him* a usen ove them jis' es bad es a skeered dorg kin beat a crippled mud turkil. *Fourly*, that I kin chamber more corkscrew, kill-devil whisky, an' stay on aind, than enything 'ceptin only a broad bottomed churn. *Fivety*, an' las'ly, kin git intu more durn'd misfortnit skeery scrapes, than enybody, and then run outen them faster, by golly, nore enybody."

Sut is the spirit of mischief. He is trouble let loose. He is the practical joker per se, though his pranks are sometimes much more than a joke and show a cruel and vicious streak in his nature. He goes to the quilting at Mrs. Yardley's and, as he has not been invited, he lingers outside the house meditating revenge for the social slight. Quilts of all patterns are spread on lines across the yard and around it. Sut finally finds a nervous horse tied to a swinging limb at the back of the yard. He ties the center of a clothesline loaded with quilts to the saddle horn, cuts the limb nearly in two, and then hits the horse with a paling he has wrenched from the fence. The horse dashes away, quilts flying, catching more lines of quilts and tearing them down and frightening all the other horses so that they break loose and run away. Mrs. Yardley herself and several other people are caught into the maelstrom and suffer various injuries. What had been a peaceful scene is reduced to a shambles. The men of the group get after Sut with dogs and chase him over the mountain. Only one dog gets near him. He waits for that one, catches him, slits his ears and pulls his

"George Washington Harris, "Sut Lovingood's Sermon," *Humor of the Old Southwest*, p. 157.

hind legs through the slits past the elbow and throws him on the ground. The rest of the dogs stop to chew this one up, and Sut gets away.

Many of Sut's adventures seem excursions into the totally improbable, such as his drinking the soda and acid, given separately, because Sicily Burns tells him it is a love potion, and then riding several miles giving out a continuous stream of foam and frightening several people badly. Perhaps his biggest caper was at Sicily Burns wedding. Sut had been in love with her, but she had chosen to marry the circuit rider, a man completely at the opposite end of the scale from Sut. He was not invited to the wedding, but comes anyway and arrives while all the guests are inside at the wedding feast. He sees a bull reaching into a basket for a few grains of corn and slips up and pulls the handle of the basket over the horns of the bull. The bull naturally begins to run backward. He backs over the "bee bainch" and turns all of the hives over. Finally, loaded with bees, he backs into the door of the house and against the row of tables holding the wedding feast. Naturally, the bees attack the wedding guests and they have to do everything from rolling on the ground to diving in the creek to get rid of the bees. The wedding ends in complete disaster, and Sut predicts that the bride and groom will never get along.

Sut is the snake in the garden, the fox in the henyard, the perfect spirit of disorder. When he comes onto a peaceful scene he turns it to complete chaos.

As has been seen from the brief samples I have given here, there is much violence and a good deal that is vicious and ugly in old Southwest humor. There is also much that is gentle and humane which shows the better side of human nature. The stories perfectly illustrate Edgar Allan Poe's theory that humor lies often in the strange and the fantastic, but if the author ventures far into the grotesque he will be out of the realm of humor and into the realm of terror and horror.

How much William Faulkner had read of these stories is impossible to say. It is very probable that his grandfather's library contained, Joseph Glover Baldwin, Augustus Baldwin Longstreet, Thomas Bangs Thorpe, and a number of other writers that were popular locally. It is known that Faulkner



owned a copy of *Sut Lovingood* and that he had read these tales.

There are several similarities between some of the writings of Faulkner and some of the tales which are apparent at first glance. Both Faulkner and the humorists write about the same sort of people, though Faulkner writes about other kinds as well. Both use dialect, and whenever necessary they use phonetic spelling in attempting to give the exact pronunciation. Both were keen observers of folkways, customs, habits, manners, and morals. Neither Faulkner nor the humorists pronounce judgment of their characters; they follow Henry Fielding and present human nature in many situations and conditions. They do not moralize.

A little examination will show that Faulkner uses many devices that were used by the humorists. I shall attempt to show a few of these.

Davy Crockett's trick in snitching the coonskin five times and selling it to the rum-seller is taken by Faulkner, blown up to great proportions, and made almost moral in *The Unvanquished*. Old Mrs. Sartoris had her mules and her silver taken by Yankee troops. She determines to get them back and goes to headquarters. There the fates arrange that she meet a humane Federal officer who provides her with a requisition for several chests of silver and more mules than had been stolen from her. She gets the mules and the silver and goes home. It is only after she had been at home some time that she realizes that the voucher for the mules was not taken up and is still valid. She is also conscious that practically all of the small farmers have been deprived of their mules and cannot make a crop without them.

It is then that the great idea comes to her: she will continue to withdraw mules from the Federal depots as long as the requisition is honored. She enlists the aid of Ab Snopes, a man who will do anything, preferably dishonest, that will bring him any gain. Granny and Ab, usually with the two boys, young Sartoris and Ringo, a Negro, go to Federal Depots all the way from Memphis to Birmingham, each time collecting the hundred and ten mules that the requisition calls for. The business becomes more and more risky. Ab is not to be trusted and is likely to betray the old lady any time that his greed is not

satisfied. He is hand in glove with criminal elements in the area. The old lady is suspected of accumulating thousands of dollars from the sale of the mules. Actually, she pays off Ab in mules and gives the rest away to farmers who are badly in need. Finally, she is killed by the leader of a band of outlaws. Young Sartoris and Ringo bring her home for burial and then set out to find the killer. Eventually they find him, and after killing him young Sartoris brings home his hand and fastens it to the headboard of Granny's grave.

Faulkner has used the same device as Davy Crockett, but with what a difference! Granny Sartoris is a person of sterling worth who would never stoop to any base action for her own benefit. Yet for the sake of her own people who are helpless in the power of a ruthless conqueror she will do anything, even to sacrificing her own conscience for her people and her State.

One of Faulkner's stories that shows a world of order reduced to disorder is "The Waifs."<sup>8</sup> This tale was later included in *The Town*, but was greatly reduced in length. The town of Jefferson was going peacefully about its business one summer morning when the train stopped and the conductor put off "four things" which did not resemble children at all but resembled beings from another planet with little resemblance to humanity. Around the neck of each was tied a card bearing the inscription "From Byron Snopes, El Paso, Texas to Flem Snopes, Jefferson, Mississippi." They are the children of Byron Snopes and an Apache squaw. They are a girl, two boys, and one little one dressed in a garment that might have been part of a tent whose sex was never identified. Flem refuses to have anything to do with them and quarters them on Dink Christenberry at the Jefferson Hotel.

The four aliens always go together and make no attempt to communicate with anybody else. They seem able to go into or out of the hotel without anyone perceiving how they do so. One night the night policeman observes them near the bottling plant coming from behind the building, and when they get near smells warm syrup. He advances toward them but stops in time when a switchblade knife appears. He could not tell which one drew it, but he backs away and tells them to go

<sup>8</sup>"The Waifs," *The Saturday Evening Post*, May 4, 1957.



home. Upon investigation it is found that they have been in the plant, though the doors are locked and the burglar alarm system has not been disturbed. They continued to get in, and nobody can tell how. They seem to be always awake and wander over the town at all hours of the day and night. A superstitious dread grows up about them among the people of the town.

A short time later a wealthy woman loses a pet poodle, a pampered little brute that is fed costlier food than most people in Jefferson eat. The dog is hunted for high and low. Finally, a cave is found in the wall of a big drainage ditch, and in the cave is a little pile of bones. The evidence is clear that the children have eaten the dog. Flem Snopes pays the five hundred dollars that the dog was insured for without a murmur, but sends them out of Jefferson down to Frenchman's Bend to live with another Snopes inlaw, Dewitt Binford. They get along fairly well, but Dewitt is consumed with curiosity to know whether the smallest is a boy or a girl. He dopes four bottles of pop with a sleeping potion and leaves them where the children will pick them up. Late at night he crawls into the bedroom where they all sleep on a quilt, they will not sleep on a bed, and is extending one hand to lift the child's garment and the other ready to snap on a flashlight, when he feels a keen pain, first on one side of his face and then the other. He has been slashed with the knife. He runs backward on all-fours out of the room and into his own room, pushes a chest against the door, shuts the windows, and keeps the lamp burning through the rest of a hot night.

The next day another of the Snopes boys, who had been trying to teach the children to hunt, is found tied up to a black-jack oak with a pile of wood beside him. The children are sent back to Texas with directions to take them across the Mexican border and turn them loose, and Frenchman's Bend breathes easily again.

A better story is "The Spotted Horses," which also has its locale in Frenchman's Bend. In the action before the story begins, Flem Snopes has married Eula, the pregnant daughter of Will Varner, and gone to Texas. Suddenly, one day Flem and a Texas man appear in a wagon, and trailing behind the wagon is a troop of wild Texas horses, wired together with barbed

wire. There is an announcement that these will be auctioned off. All the poor little farmers seem to be hypnotized into the belief that they must buy one or more of these wild horses. They are wild, utterly worthless, and vicious, but the spell of compulsion seems to be on the men. The Texas man gives Eck Snopes one horse to start the bidding, and then sells him another one. The men are spending their seed money. Henry Armstid even spends the five dollars his wife has earned to buy the children shoes. Finally, when the horses are all auctioned off, Henry goes into the lot to catch his, is run over and has a broken leg. The horses escape from the lot. One runs into Mrs. Littlejohn's house, dashes down the hall onto the back porch and confronts Mrs. Littlejohn who is coming in with an armload of clothes. She hits it over the head with a washboard and it goes back through the hall, over two people, and jumps off the front porch. Another wild horse runs into Tull Snopes and his wife and daughters as they are coming from town. Just as the wagon is crossing a bridge, the horse runs between the mules, up the wagon tongue, and into the wagon. The mules run away, snatching Tull out of the wagon and upsetting all the women folk. None of the horses are ever caught. As soon as the Texas man leaves, and the horses disappear, quiet settles once more upon Frenchman's Bend.

In his long story "The Bear" Faulkner goes far beyond Thorpe in "The Big Bear of Arkansas." Old Ben is the archetype of all bears, the bear god whom the Indians prayed to before they hunted the bear. Faulkner puts two Indians, old Sam Fathers and Boon Hogganbeck, into the story to amplify the mythic quality.

Old Ben, who has one crippled paw, has long been known in the area where the McCaslins, De Spains, and others go for a yearly hunt. Young Ike McCaslin has been initiated into woodcraft by old Sam Fathers, who marked him with blood when he killed his first deer. He is consumed with a desire to see old Ben. Finally when Sam thinks he is ready, he tells Ike that he must leave his gun behind or he will never see old Ben. To see the Arch-Bear he must first go through a process of purification. He must cast out fear, he must love the wilderness and all wild things, and he must go unarmed into the woods if he expects to see the Arch-Bear. Young Ike goes into the woods with only a compass and a watch. After walking for



more than half a day, he stops to rest, but when he tries to go on he realizes that he is lost. He circles in one direction and then another. Finally, he realizes that he must leave his watch and compass, he must strip himself of everything artificial if he is to see old Ben. He leaves them behind. Suddenly he sees a tremendous bear track that is still filling with water. He raises his eyes and sees the old bear, grand, lonely, and terrible, but causing no fear in his heart. Following the bear, he finds his watch and compass, and soon finds the way out.

To Hunt the Arch-Bear there must be an Arch-Dog. Major de Spain finds that some huge beast is killing his calves. It is a monstrous dog. Finally, the dog is trapped, tamed, and trained by Boon Hogganbeck. Boon seems to worship the dog as Sam Fathers worships the Bear.

The day of the great hunt arrives. After a tremendous chase and many incidents the bear is shot. He, the dog Lion, and the hunters, swim the river. There is a final fight between the dog and the bear, but the bear is not killed until Boon Hogganbeck gets astride of him and finishes him with a knife. Lion dies of the wounds received in the fight.

Using the same topic as Thorpe, Faulkner has raised a hunting story to an epic. A deep love of nature and all wild creatures, runs through the story. It is the ancient tale of man hunting to live, yet having a deep love and respect for what he must destroy.

I have touched on only a few of the writers of old Southern humor and only a few of Faulkner's tales. A thorough study would show a much more extensive and deeper relation between Faulkner and his predecessors. There is no intent here to suggest any plagiarism by Faulkner. He simply found the same sort of material at hand, and with the skill of a great artist transmuted his material into something more meaningful and more powerful than any of his predecessors had done.

## "ENCOUNTER WITH NOTHINGNESS?"

NEUTON S. STERN

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Read Before "THE EGYPTIANS," December 16, 1965  
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I must confess frankly that I have read more *about* existentialists than *of* their own own writings which are very extensive and not always easy or clear. My opinions expressed here are therefore at second or third hand, and for errors I hope may be forgiven by those who are familiar with the original writings. Excellent scholars can summarize, however, and from a few of these I have tried to get some understanding of existentialism, a word now rather freely bandied about, but little understood. It is no wonder that we are confused, there have been so many points of view. Having cleared up the mystery somewhat for myself, my conclusions may perhaps a little clear up for you the dark glass.

It seems that there are two wings of existentialism, the religious—in the sense of including God, but not necessarily based on a religion—and the atheistic. The first category, while historically dating back much further, seemed to take its modern start with Kierkegaard, and many theologians have followed him. Herberg, in his "Four Existentialist Theologians," has selected four of these as exemplars from four entirely different "religious" background, Roman and Orthodox Catholicism, Protestantism, and Judaism—Maritain, Berdyaev, Tillich and Buber. "We can describe thinking as existentialist if it makes existence rather than essence the starting point . . . human existence . . . the human situation . . . the human predicament." These four men made the individual the base of thinking about human life, but each does so in his own and different way. They find that man does not live alone, so they all soon place him in the community of men, and then describe the relationship of man to God.

I shall not attempt to describe the different type of existentialism as proposed by those four men. I shall take only one, that of Martin Buber as disclosed in his famous but short book entitled "I and Thou." A profound student and friend of his,



Maurice Friedman, has summarized it succinctly and much better than I could possibly do, in the following quoted paragraphs:

Buber "distinguishes between the I-Thou relationship which is direct, mutual, and present, and the "I-It," or subject-object relation in which one relates to the other only indirectly and non-mutually—knowing and using him. The difference between those two relationships is not the object to which one relates: one can relate to a cat, a tree, or a painting as one's Thou, and one can and often relate to a man as It. What is decisive is the relationship itself—whether it is sharing or possessing, imposing on the other, or helping him to unfold, valuing the relationship in itself, or only a means to an end.

"In 'I-Thou' I am open to you and respond to you; in 'I-It' I do not lose the closed circle of the self, whether I emotionally identify with you or objectively observe and analyze you. I-Thou is a dialogue in which I accept you in your unique otherness. I-It is a monologue in which, even when I converse with you at length, I allow you only to exist as a content of my experience.

"Real dialogue need not be with someone one knows well or not at all. It can break out 'in the tone of a railway guard's voice, in the glance of an old newspaper vendor, in the smile of the chimney sweeper.' It does not mean having much to do with the other—'I know people who are absorbed in "social activity" and have never spoken from being to being with a fellow-man.' I-It is always a partial relationship, I-Thou is a relationship into which I enter with my whole being. I am open to you in your uniqueness, and I respond to you from my own.

"God, to Buber, is the 'eternal Thou' that is met in every finite Thou. As such he can only properly be addressed and not expressed.' 'If to believe in God means to be able to speak about him in the third person,' Buber once said, 'then I do not believe in God. But if it means to be able to say Thou to Him, then I do!' God can be known only in meeting—in mutual contact—not as an object of detached thought . . . God is *not* a person, but our relationship to Him is personal . . . (He) places upon us the demand that we become real, that we become human."

The average American who thinks at all about this subject is more apt to know about the French "school" of existentialism because of its startlingly dramatic and different beliefs. This camp founds its belief also upon the individual but is so pessimistic about man's place that he ends up not with God but with nothingness. The individual means himself. He does not understand how or why he is here, yet finds himself here. "What shall I do with myself," he asks profoundly, "what can I make of myself?" He finds that the world is not made for him, nor he for the indifferent world. No answer. If he wants answer, values and purposes, he must perforce "invent them" for himself, says Kaplan. If his inventive powers are so weak and thin that he can imagine none, then life must be dark and bleak indeed and there is nothing to live for. No wonder he is pessimistic and anxious as he stands on the brink of nothingness. No wonder there is only boredom, sorrow, fear of extinction, trembling in the face of death, anxiety.

How did man get himself into such a state? Barrett, in his "Irrational Man," has tried to trace the steps by means of which man has come to feel himself "an outsider even within his own human society. He is trebly alienated: a stranger to God, to nature, and to the gigantic social apparatus that supplies his material wants" as well as to himself. The substance for the argument for this sense of alienation is that, since the Renaissance, man has shifted from dependence upon religion to dependence upon Science, and science is betraying him. Holton, describing a recent trend of thought, compared science to a maze whose outer wall has innumerable entrances "through each one of which one can hopefully reach, sooner or later, the one mystery which lies at the center." But, he continues, there is a possibility "that at the inner-most chamber of the maze one would find *nothing*. (His italics).

Since Kierkegaard, man has gradually but openly been stripped of his security in this world and stands forth today in his nakedness before the yawning abyss of nothingness. He is overwhelmed by anxiety, fear and trembling. As a physician for fifty years I have personally confronted man in his physical and spiritual nakedness, and have found him no more anxious, fearful and tremulous now than in my early years. There have always been some afraid of death and the unknown and some



courageous in the face of it, at times ready and even eager to enter into they know not what.

Of what then has man been stripped? What has been his support in time of trouble? In the West, medieval man lived his life ensconced in the cocoon of religion and morals (no real distinction being made between them). Yet history tells us that in spite of the power of the church there was much murder, thievery, adultery among churchmen as among the populace. When Renaissance man burst forth from the chrysalis, these evil things went on as before, but the enshrouding controls of the church were ruptured and torn by the new science, the Reformation and the new sense of freedom. The butterfly came forth and shone in the sun. The shattered cerements remained however and thousands clung to them as home and do to this day. Secularism, science and materialism began their powerful march. The first garment thus stripped from man was the belief in the absolute power and "rightness" of the church.

The bright promise of immortality became clouded. Every man, every priest pictured Heaven and the after-life differently. Even Dante with his preciseness of delineation used his Inferno, Purgatory, and Paradise as a political document—a magnificent tour de force of the imagination to be sure, but still imaginary. Any real evidence of the after-life after all these years has failed to come forth. The second garment of security was stripped from man's back.

The morals of men have not changed greatly in the West in nearly three thousand years. In other parts of the world with different mores, both in times past and places varied, morals have differed greatly. Anthropology tells us this in no uncertain terms. With the spread of Western civilization our set of customs becomes preponderant we think, but it is not yet accepted by 400 million Indians, and 600 million Chinese. For morals there is no arbiter, although the churches claim to be, for morals are purely a function of social life. The third garment is gone and man gets chilly from exposure.

Until three or four hundred years ago man's place was supremely in the center of the universe. Now he is infinitely small in a corner of the infinitely vast universe. His pride and pomposity are deflated—his balloon has burst. Nature cares

nothing for him. His church told him the sun, moon and stars had been made for him, but now he feels his terrible insignificance. Stripped of his self-blown up self-importance, he has only his nakedness left.

Was it bad then that these coats of many colors were snatched from him? These frail reeds, to change the metaphor, were broken, their strength had been only the unsupported pronouncements of man, and man was left to hobble alone. Had in the past his strength been in the reed, or had it always been in himself? Now compelled to walk without any help, he goes on to greater strength because he is no longer fooling himself. He begins to trust his own manhood, not an external brace. "Religion is no longer the center and rules of man's life." (Barrett, p. 21). A short character study of a simple Mexican Indian included this sentence. "Alejandra, you are a good Christian" (for giving tiny presents and wild flowers out of her poverty). "No, Senora," she replied, "I don't do these things because of religion, but because I want to."\*

Reinhold Niebuhr, one of the most prominent Protestant theologians of our day, discussed "Some Things I Have Learned" in the November 6, 1965 number of the Saturday Review. He said that he had concluded that religious faith was a "trust in the meaning of human existence" and that such a faith would "explain why religion has survived—despite obvious weaknesses—even in a secular age." No word of God at this point. Later he speaks of God however as having an "ultimate and transcendent character" but is not very clear about how God assumes His place in human life.

There is another group of existentialists who base the dignity of their lives, their thoughts and actions, upon the existence and the experience of men without reference to any supernatural being. They are widely scattered over the world and have no central or formal creed. In the broadest terms, they think that man's meaning, dignity, and usefulness depend upon how well they conduct themselves in the world by their own decent lights with respect to all other men, and what they can do to ease the hard lot of others, to explore and solve even a little the predicament of man and to the knowledge and under-

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\*The Humanist, Yellow Springs, Ohio, 183: 6, 1964.



standing of the universe and themselves by their study and activity in the community of men. They feel they are not deceiving others or themselves when they abrogate faith in the supernatural. They feel they are thoroughly honest in their attitudes toward the "religious" activities that men have busied themselves with since before historical days.

All existentialists thus are not poorly endowed with imagination. It is surprising that as competent a philosopher as Sartre (and his French followers) follows the barren trail. Others do invent values and purposes for themselves. Whether or not they call upon a deity, a value is according to Ralph Barton Perry the interest that a man imputes into a thing, person, idea, or fact. If he has no interest, the item has no value. A baseball fan is not inclined to give a hoot for philosophy; a painter sees nothing in science except as a producer of new pigments or canvases. But each man has an interest in many things, and these interests—values—are more or less compatible with each other. When many men live together these congeries combine into a system of values of that particular culture. This may permit of all the eccentricities of individuals, but basically it is the core upon which all agree, and which may be in good part the result of written and oral tradition. But even this core gradually alters as times change and new experience impinges. Originating with the ideas of the people, the source and milieu of the system of values is social. This is what religions are, and what morals are.

In the face of this, men find that they can choose. They have been called the decision-making animal. They can turn to the right or to the left, they can accept or reject a moral or religious teaching, they can reason or go stale and sour, they can pass into darkness or look full upon the light. This ability to choose seems such a little thing, a trifle only, since in itself it offers nothing—apparently. But it is a thing of great power, for upon it depends the future of the individual—toward the gutter and seventh Hell, toward the mountain top. That a choice is made and life is turned toward some end does not mean that the goal will be reached and the end accomplished. How few ever succeed in this! Lessing once said that not the truth, but the forthright endeavor to reach the truth makes the worth of a man. What shall be the goals? Every man must invent his own, or choose among the endless possibilities that

have been proposed. There have been many sad failures among the men who have had others select their goal for them, or even develop it for themselves but each must determine for himself what he shall try to be.

Choice is followed by two important consequences. The first is that if a man *can* choose, it means that he is free to choose. His heart and mind are free—free! Even if his body is in the chains of servitude, if his tongue is forbidden to speak, no one can keep his mind from thinking, from soaring to great heights. Political freedom may be taken from him, but never his intellectual freedom for this is of his own making, and in it lies happiness and joy. He possesses self-consciousness, reason, understanding.

On the other hand as real freedom follows choice, so does responsibility. When we choose, we must suffer the consequences, good or bad. In so far as we take the path on the right hand, rather than on the left, we must meet the heartaches and difficulties, face the obstacles and failures, as well as enjoy the benefits and triumphs that may be encountered. Our choices have consequences, not only for ourselves but for other men, even the world as a whole; good or bad for us may be good or bad for them. We can never see the results, alas, and this is a profound reason for the anxiety that some existentialists make such a point of.

A man rests upon himself. Insofar as he relies on others he weakens himself and drains the others. He should follow the Prophet's advice—do justly and love mercy. Let him face the future and death with frankness, equanimity and courage, not in anxiety or with false hope. Dignity resides in self-respect, an acknowledgement of our finitude and a fair judgment that puny man does not deserve either life or punishment unto all eternity. Dignity, self-respect, integrity, courage. O Death, where is thy sting?

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## THE NEED FOR BASIC RESEARCH

O. H. ALDERKS

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*Read Before "THE EGYPTIANS,"* January 20, 1966  
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Chemical Research & Development has been a mode of life for me for the past 40-odd years, since the early 1920's. In retrospect, during all of that time its pursuit has been a challenging broadening experience from day to day and from year to year. Obviously in its daily pursuit it has supplied its share of frustrations; but over-all, as I reflect about it, its rewards and its joys have been such that I would look forward with anticipation and eagerness to another four decades of work in this area if that were possible.

During the last three years I have had time to indulge my mental appetite for reading about R&D in other scientific disciplines, such as physics, biology, astronomy, and medicine; and I would like to review with you my impressions of the tremendous growth in R&D, its exciting implications, and indicate some needs for the future as it appears to me.

Most of our early inventions came from the work of university professors who pursued inquiry in their respective disciplines. Frequently students became inventors, and industry often employed some professors on a space-time basis, and this was the beginning of applied research.

The first U. S. company to organize a continuing research activity is reported to have founded its laboratory in 1900. As late as 1925, there were only about 150 industrial research laboratories in this country. This compares with over 5400 today. Perhaps a brief review of the expenditure of money in this country for R&D will indicate best the increasing significance and importance of this activity.

In the late 1920's the expenditure for research of all types,—university, military, agricultural, industrial, and medical research, amounted to about \$160 million, or about .15% of our gross national product. Although we thought that we were in the scientific era, R&D expenditures during the 1930's re-



mained relatively low, rising by 1940 to about \$345 million. Then the impact of World War II struck our economy; and scientific research and development activities sky-rocketed, since War produced problems which needed to be solved to assure our very National existence. By the end of the War, the annual rate of spending for R&D was about \$1.3 billion.

Industry learned an important lesson through wartime research. Industry found that it was profitable, partly as the result of high taxes, to develop a backlog of technical developments ready for commercial exploitation; but even more important, Industry discovered Research as a new frontier. By investing in research a company could develop new products, improve old products, cut production costs, and solve raw material difficulties. The development of new products and of entirely new industries as the result of research was undoubtedly an important factor in preventing the expected business depression after World War II.

Industry learned another important lesson through war time research, namely, the accelerated progress that can be obtained by "Team Research." As late as fifty years ago, most research was a spare time activity of university people; it was completely individualistic. The scientist worked by himself,—he had available the published results of other investigators in his field; and he, in turn, published his findings, and so advanced the knowledge in his discipline. The idea of cooperative effort among scientists to accelerate the rate of progress of discovery and solution of a technical problem came slowly. It was natural, of course, for scientists working together in an industrial laboratory to consult one another about different phases of a problem; and so some sort of rough team work evolved. From this, it was natural to assign a problem to a senior scientist or a group of senior scientists who appraised the problem and then assigned portions of the problem to scientific specialists best qualified by training to solve certain phases of the problem.

For example, large research organizations have available excellent library facilities to aid them in ascertaining quickly the work that has been done on certain specific problems or allied problems. These libraries are staffed often by Ph.D. librarians familiar with research work in various disciplines. These staff

people read the current literature in various languages and record the material in abstract form on cards; the information is subsequently recorded on tape and stored in an electronic memory system. The ready retrieval of information on any scientific subject is most important to prevent duplication of effort and this is a very important phase of team research.

At one time it was thought by some scientists that team research would stifle individual initiative and professional development. However, scientific knowledge has increased so tremendously in every field that it has become necessary for individuals to specialize in certain limited areas of a discipline. For example, today we have spectroscopists, phase rule specialists, electron microscopists, cellulose chemists, water chemists, petroleum chemists, corrosion metallurgists, etc., to mention only a few of the many, many types of specialists. To be sure, a scientist may have a broad training as a physicist, biologist, astronomer, biochemist, organic or physical chemists, etc.; but usually he will specialize in a limited area of this broader discipline and so become a proficient specialist in a portion of the broader scientific area. This is surely evident also in the medical field where we now have many specialists.

Large research organizations have on their staffs many capable research specialists; each has available often costly specialized equipment, for example, an electron microscope, a computer, or spectographic equipment. Since each scientist is working in his field of high proficiency, there is no waste of time while a man acquaints himself with some elements of science foreign to his training. The researcher thus has greater opportunity to develop professionally. A chemist specializing in cellulose chemistry becomes equally as expert in his field as a specialist in surgery with comparable professional recognition among his scientific peers. Team research received perhaps its greatest impetus from several great wartime successes such as the Manhattan project which literally employed thousands of very capable scientists to produce the atomic bomb. Now, all large scientific laboratories use teams of research and development scientists to solve their problems; and they can produce results in a few months what formerly would have taken years to accomplish.



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The development of team research has had a tremendous effect on our economic progress. It has resulted in a steady stream of new and improved products from all segments of industry, and it has produced entirely new industries; all of which has contributed markedly to the continuous rise in our standard of living. Research is such an important factor in our economic life, that investors are definitely interested and concerned with a company's research and development organization. Investors want to know the attitude of management toward Research and Development as a continuing effort. It has become apparent that a considerable length of time is required to build a successful R&D organization, and that this company operation must be a continuing effort. It is definitely not a company function that can be turned off and on as water from a faucet. It is a costly operation, and various industries spend from 1/2% to 10% of sales for R&D, with an average for all industry at about 2% of sales.

Early during World War II, President Roosevelt appointed Dr. Vannevar Bush, who had been dean of engineering at M.I.T. and was president of the Carnegie Institute, as Head of the National Defense Research Committee and subsequently Director of the "Office of Scientific Research and Development." (1941-1946). Under his leadership scientists throughout the nation worked on many varied research and development projects to assist the nation in its war effort.

Near the end of the war, under the leadership of Dr. Bush, in his report "Science, the Endless Frontier," American Scientists proposed to the nation that government should support *basic research*. The report pointed out that basic research would not be produced automatically by industry or by government in their efforts to apply science and technology to their own purposes, and that as a matter of *policy* government should support basic research, *without regard to its application*. As the result of the Bush report presented to President Roosevelt, the traditional policy of the U. S. was reversed in two ways: it persuaded universities and private research institutions that they should ask the government for financial help, and it persuaded the government that *basic research* as well as applied research deserved support.

Before the war the U. S. had been weak in basic science and

had to rely on fundamental knowledge produced by European scientists to guide them in the development of the spectacular new weapons. For example, in the field of nuclear research one finds such names as Einstein, whose law of the equivalence of mass and energy ( $E = MC^2$ ) was first regarded as a matter of mainly philosophical interest; later it turned out to have tremendous practical implications; J. J. Thompson discovered the electron; W. K. Roentgen discovered X-Rays; Henri Becquerel discovered radioactivity; the Curies' worked with radioactive radium and thorium; Rutherford identified the atomic nucleus and the alpha and beta rays; Max Planck showed that radiated energy was given off in finite "quanta" instead of continuously; Niels Bohr, Max Born and W. Heisenberg extended the quantum hypothesis with great success. Chadwick next discovered the neutron and Fermi then showed that neutrons, which are not repelled by the nuclear electrical charge, are most efficient projectiles for disrupting atomic nuclei. By 1930 Cockcroft and Walton had begun to attack the nucleus with accelerated particles, and in 1932 Lawrence invented the first cyclotron. Hans Bethe showed in 1938 that one can account for the heat developed in the sun and the stars by a nuclear process that fuses four hydrogen nuclei to form one helium nucleus. The reverse phenomenon,—the fission of the heavy nucleus of uranium into almost equal parts, was discovered by Hahn and Strassmann also in 1938. This was found to be a self-supporting chain reaction once it was initiated by which enormous energies were released. All of these discoveries, as is now well known, led to the production of the atomic bomb; and all of the above were European university scientists. These physical scientists and their students worked as *individual investigators*,—theirs was *intensive* basic research which leads to the discovery of fundamental laws of nature. This type of research, often called "free" research is directed to such basic questions as the ultimate structure of matter or of the nature of life. Examples other than nuclear and subnuclear research are research on Darwinian evolution, chromosomal inheritance, nonchromosomal genetics, and the structure of proteins responsible for the genetic code,—the Crick-Watson model of DNA, etc. This type of pioneering research is entirely *unpredictable*, and one does not know what one is going to find,—what new ideas may result or what the *consequences* may be.



Another type of research is *extensive* basic research, which has to do with the explanation of phenomena in terms of known fundamental laws. Extensive research is often called *mission related* research and lends itself to team attack. Both types of research are equally important, but there is always much more extensive research under way. Once new fundamental laws are discovered, much activity begins to exploit the new knowledge. A prime example of this is the tremendous effect of discoveries in nuclear research on the other sciences and on new technological developments. For example: the new ideas of atomic nuclei and electrons transformed Chemistry from a large mass of empirical knowledge into a coordinated science by the development of a structural theory which has produced a unified system. The production of radio-active tracers has completely altered the biological sciences, and also plays an important role in archeology. In astronomy a clear picture is emerging of the manner in which the elements are formed. In our *technology* nuclear research has created a new source of power. Dr. Glen Seaborg, chairman of the Atomic Energy Commission (AEC), has predicted that in 15 years we will have dual-purpose reactors capable of developing a million kilowatts of electricity and of desalting sea water to produce 500 million gallons of potable water per day. One can imagine how important this will be to cities located near the sea coast. He predicts that in 35 years from now nuclear power will produce about half of the electricity in the United States.

Shortly after World War II (1948), growth of R&D in the U. S. had risen to an annual expenditure of \$2.0 billion dollars. Seven years later (1955), its annual rate of expenditure had doubled to \$4.0 billion. Six years later, it had more than doubled to \$9.2 billions annually; and this past year (1965), Federal spending for R&D is \$15.3 billion, about 15% of the Federal budget. The estimated total R&D expenditure, Federal and Industry for 1965, is about \$21 billion dollars,—about 3% of our gross national product. The 1966 Federal budget for R&D calls for an expenditure of about \$15.4 billion; hence, a leveling off at about 15% of the National Budget. The DEFENSE, SPACE, and ATOMIC ENERGY programs account for about 83% of this R&D budget. About 9.5 billion dollars will be spent for *development*, and 80% of this work will be done by Industry under contract. About \$5.5 billion

will be spent for *Research*, which includes about \$2.2 billion for *basic research*, of which about \$1.8 billion will be spent in University laboratories. From the foregoing, it is evident that the growth of R&D in the U. S. in the past 20 years has been phenomenal,—to think of spending \$2.2 billion for basic research in 1966 stretches one's imagination. This annual expenditure is more than the entire cost of the Manhattan project during the war years. Its impact on our economy and on our way of life will be tremendous.

Recently a committee of the Atomic Energy Commission investigated Memphis as a possible site for the \$348 million Synchrotron, particle accelerator. This projected research project is to investigate the nature and architecture of sub-nuclear matter and the laws that govern it. It is at the very frontier of intensive basic research. Since all matter is composed of the same fundamental units, the ultimate foundation of all natural sciences must be based on the laws governing the behavior of these elementary particles. This project, it seems to me, is most important. It is so costly in equipment first cost, and in annual operating costs, that almost every state in the Union is striving to obtain this facility. I doubt that any one of us can possibly imagine the *intellectual* impact, aside from its economic impact, that this research operation would have on Memphis and its environs in the next 20 years if this high energy particle accelerator were to be located here.

In September 1965, President Johnson issued a major policy directive on Federal support of University-based research. His statement to his Cabinet follows: "I am determined that we shall marshal our resources and our wisdom to the fullest to assure the continuing strength and leadership of American science and to apply the information yielded by its inquiry to the problems which confront our society and our purposes in the world. Our policies and attitudes in regard to science cannot satisfactorily be related solely to achievement of goals and ends we set for our research. Our vision in this regard is limited at best. We must, I believe, devote ourselves purposefully to developing and diffusing—throughout the nation—a *strong and solid scientific capability*, especially in our many centers of advanced education. At present, one-half of the Federal expenditures for research go to 20 major institutions, most of which



were strong before the advent of Federal research funds. During the period of increasing Federal support during World War II, the number of institutions carrying out research and providing advanced education has grown impressively. Strong centers have developed in areas which were previously not well served. It is a particular purpose of this policy to accelerate this beneficial trend, since the funds are still concentrated in too few institutions in too few areas of the country."

This statement shows that the President and his advisors have reached the conclusion that basic research has a tremendous impact on the University environment and also a correspondingly great impact on the surrounding region. Hence, it is desirable to spread these benefits across the country. The public also has come to accept the argument that progress flows from basic research, and that material and social benefits in the future derive from the most abstract investigations. It has come to accept the belief that the health and intellectual tone of a community or region is improved by the presence of strong, alive and vigorous universities.

Dr. Donald F. Hornig, special assistant to the President for science and technology, in discussing the President's policy directive on support of university-based research, pointed out that in the past Federal research funds have been granted to talented, promising individuals who proposed worthwhile creative, original, and significant researches. Thus, in the past, we have operated a system based on talent and on merit of individuals. This support, he states, will be continued; but funds will also be made available to a large number of other universities. He goes on to say "one of the most striking characteristics of the university scene today is the growth of strong centers of scholarship and research. There are many more good schools than there were two decades ago. What is even more striking is the growth of the ambition to be excellent, the ambition to be strong. All over the country there are schools which in the past awarded no advanced degrees and whose faculties were little concerned with scholarship, which are now on the road to academic excellence. These schools have recruited stronger faculties and are building new facilities and aspire to compete with the established centers of strength. These schools want help and deserve help; and if given support

will, in many instances, achieve the kind of excellence which has been realized by the best of the older institutions." The many Federal programs of support of science involve today about 400 colleges and universities, including substantially all Ph.D. granting institutions in all parts of the country. This policy, it seems to me, will have a tremendous effect in strengthening the science potential of the nation. In the final analysis, it is the continuing development of brain power which will be most important to the nation and to the world.

As one looks backward and forward about 35 years from today, what have been some of the major accomplishments in various scientific disciplines, and what may one look forward to? Obviously in the interest of brevity, one can mention only a few highlights. The progress in engineering has been truly amazing. The development of the internal combustion and the jet engines have literally changed our mode of life. Flying was mostly a dream when I was a boy, and wireless only a novelty. Today we are a traveling people,—our automobiles and trucks are so numerous, and the discharges of combustion so concentrated and noxious in certain localities that research is under way today to replace the internal combustion engine and to take the "Tiger" out of the tank. Our planes now fly faster than the speed of sound, and we are developing commercial planes to fly at speeds in excess of 1/2 mile per second. Intercontinental missiles have been developed which travel at speeds in excess of 2 miles per second. We have built a variety of observational satellites and are well on our way to explore the moon and neighboring planets in the near future. The development of the electronic tube and the more recent transistors have resulted in the production of very sophisticated electronic computers to assist man to guide and control these satellites. We use these electronic devices in radar for increased safety and comfort in air travel and for observing and remote-controlling critical operations in a factory; and for teaching many others as for example,—a group of young doctors observing the technique of a skillful surgeon in performing a particularly difficult and delicate operation. The culture of our civilization can be brought into our homes even in the remotest parts of our country. By means of radio and television we can hear and see, even in full color, symphony concerts, operas, lectures, plays, bands, and observe history in the making as it is enacted by man, via Telstar, in different parts of our shrunken world.



Recently, Time Magazine pointed out that as the result of United States' R&D in space, technological by-products for the business community are beginning to spin off in great volume. This fall-out of commercial products and processes promises to produce profound effects on our economy. The author states that, "Enough space-inspired products have already reached the marketplace to prove that every tax dollar invested in 'Space' will multiply many times in the economy." New products which have already reached the marketplace are: lightweight strong plastics, new metals and alloys which are corrosion resistant, new sealing compounds and paints, new fuel cells, new rugged electronic gear which will withstand stresses up to 10,000 times the force of gravity, new ceramic materials, high protein algae for food production, and a host of additional products and processes. The commercial technological fall-out from "Space" R&D is so tremendous that European leaders are very much concerned and want a part in this program. Each nation is increasing markedly its annual appropriation for R&D in an attempt, in part also, to stop the large outflow of scientific talent, and to have a part in this program. During the past ten years, there has been a very large exodus of scientists and engineers to the United States, particularly from Great Britain and from West Germany, because they found the R&D climate more exciting and more rewarding here.

Chemistry has had a phenomenal growth in the past few decades. Chemical R&D has produced a \$36 billion dollar annual chemical industry; and if one adds the \$42 billion dollar petroleum industry, which is really chemical in nature, one arrives at about 12% of our gross national product. The new products which have been produced are legion,—a few of the more important are: new synthetic fibers, new synthetic rubber, new plastics, new drugs, new fuels, antibiotics, new building materials, fertilizers, insecticides, weed killers, and methods for synthesizing food.

Dr. Charles C. Price, president of the American Chemical Society, recently suggested that the "Synthesis of Life" should be a national goal. To quote him:

"We have been making fantastic strides in uncovering the basic chemistry of the life process and the structure of many of

the key components of living systems. We may be no further today from at least partial synthesis of living systems than we were in the 1920's from the release of nuclear energy,—or in the 1940's from man in space. The political, social, biological, and economic consequences of such a breakthrough would dwarf those of either atomic energy or the space program. Success could lead to modified plants and algae for synthesis of foods, fibers, and antibiotics, to improved growth or properties of plants and animals, or even to improved characteristics for man himself." This is indeed a challenging area in which chemical research may lead us in the next 35 years.

In Medicine, research has resulted in many accomplishments, which have opened the Federal purse for support of biomedical research. For example, the outstanding immunological successes of protection against infection by inoculation has brought many dread diseases under control,—typhoid fever, scarlet fever, yellow fever, diphtheria, and polio to mention a few. Other major clinical triumphs have been the eradication of pellagra, general antibiotic therapy, penicillin therapy for syphilis, and the treatment of arthritis with steroids. The longevity of man, living under our Western civilization, has increased steadily so that today we have concern mainly about diseases of the heart and circulatory system, cancer, and diseases of the mind.

The sixth annual conference of graduate medical education at the University of Pennsylvania in late 1964 was devoted to speculation on the progress of Medicine in the year 2000. Dr. Kety predicted that the number of mentally disturbed individuals will not have been reduced; but that of the major mental disorders, the depressive illnesses will be most nearly understood. Dr. Burchenal, of the Sloan-Kettering Cancer Institute, predicted that many of the large research institutes devoted to the solution of the cancer problem will have turned their interest to problems of degenerative diseases and mental illness. Drs. Kety and Shock believe that the great breakthrough will be in the advance of our knowledge of arteriosclerosis, which will allow if not the prevention, at least a slowing of the process. Dr. Mellman pointed out that we will surely know more about the genes responsible for human variation, and that this knowledge should permit us to further



manipulate the process of natural selection. This surely has profound implications.

In Astronomy, there has been a veritable revolution in the past four decades, since my first introduction to the subject. New knowledge has constantly changed what was taken for granted a few years ago; hence, what one may say tonight may well be changed tomorrow. New instruments like the great telescope on Palomar, and the newer radio telescopes have extended the "vision" of our expanding universe. Our galaxy, the Milky Way, has an estimated diameter of 100,000 light years, with light traveling at the speed of 186,000 miles per second; and it is composed of more than 100 billion stars. The interstellar space, by Earth's standards, is almost a perfect vacuum, but is so immense that it is estimated to contain about one-half of the total mass of the galaxy. This interstellar gas is composed almost entirely of electrically neutral hydrogen atoms, which is the raw material for new stars which are constantly evolving. One of the two current theories of the origin of the universe is that hydrogen is being created continuously. Conceivably, matter could be formed from pure energy,—perhaps learning the laws which control the structure of the nucleus by such research as is projected with the high energy accelerator will help us to understand this better and possibly also it may help explain the Quasars. Astronomers tell us that there are more than a *billion galaxies* like our milky way, each with billions of stars. The evolving concept of a limitless Universe is so awe inspiring and so tremendous that it helps me to look at the North Star and then to realize that the light from it which I see tonight left there a *thousand years* ago. As one looks at the heavens, it is indeed awe inspiring in the light of today's knowledge; and one can appreciate the Psalmist's exclamation, "When I consider the heavens, the work of Thy fingers, the moon and the stars, which Thou hast ordained, what is man that Thou art mindful of him."

Before closing I want to say that I think that intensive "free" research is very important, not because of the probability that it will produce progress rapidly and so give us tangible practical benefits; but because of its philosophical implications concerning our Universe and man's place in it. Man, homo sapiens,

is a thinking individual; and by this, is differentiated from all the rest of life.

Throughout his evolutionary history, he has developed by means of study, contemplation, imagination and inspiration a variety of philosophies,—modes of conduct and ways of life for himself and for his society. Man has an insatiable curiosity about his habitat and about his own nature and destiny. *All* of our accumulated knowledge is the result of man's mind, of this process of thinking. He wants to know how this thinking process works and is busily engaged in trying to unlock this mystery.

It has been said truly that man does not live by bread alone. He has a mind and spirit which also need nourishment. Who can say that Basic Research to unlock the fundamental laws of our physical universe and of man's nature may not be the most important of all.

## OBSCENITY—A CLEAR AND PRESENT DANGER?

W. J. M. CODY

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Read Before "THE EGYPTIANS," February 17, 1966

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Recently before a House Subcommittee, J. Edgar Hoover was quoted as saying:

"The circulation of periodicals containing salacious materials plays an important part in the development of crime among the youth of our country."

Earlier he had said:

"In 1957 there were nearly eight forcible rapes per 100,000 inhabitants in the United States. In 1958 this figure increased 10-1/2%, a forcible rape occurring every 36 minutes. This truly shocking and shameful state of affairs is made even more deplorable by the knowledge that sex crimes and obscene and vulgar literature often go hand in hand.

"The time for half-hearted, oblique action against dealers in depravity is past. . . . It is robbing our country and particularly our younger generation of decency—it is a seedbed for delinquency among juveniles and depravity among all ages. If we are to survive morally, Americans must search within themselves for the answers to these questions: Have local authorities investigated to insure that laws against smut salesmen in their communities are strong enough? Is the public outcry of sufficient strength to impress local judges with the need of defending morality by sentencing filth purveyors to maximum terms? Are community and civic groups cooperating with law enforcement authorities in fighting this debasing blight?"

Last year a federal court sentenced the publisher of the magazine *Eros* to five years imprisonment and a fine of \$28,000.00.

This is the answer of the public and the law to J. Edgar Hoover's question. As this nation rushes headlong toward banishing pornographers from the land in order to protect society from their evil, I think it well to pause and take a brief look



at the basic assumption upon which this man and others are sent to prison.

The issue here is whether exposure to obscenity causes overt misconduct or objective behavior which the state may properly prevent because it is harmful to others or to vital community interests. I will attempt to show in this paper that while there seems to be much discussion of this question, there has been surprisingly little effort to synthesize relevant empirical research which may help us to discover the answer and that today there exists no research evidence either to prove or to disprove this basic assumption of our obscenity laws.

The main character in our study is obscenity. In 1821 obscenity was the book "Memoirs of a Woman of Pleasure" by John Cleland; in 1930 it was "Ulysses" by James Joyce; in 1956 it was D. H. Lawrence's "Lady Chatterly's Lover"; the circle has gone a full turn and again today it is "Memoirs of a Woman of Pleasure"—the same book only now we know it by the title "Fanny Hill."

To the legal mind, obscenity is material which deals with sex in a manner appealing to the prurient interest; material having a tendency to excite lustful thoughts; material which goes substantially beyond customary limits of candor in description or representation of sexual matters. The test our courts usually impose is whether to the average person, applying contemporary community standards, the dominant theme of the material taken as a whole appeals to the prurient interest.

When we pursue "obscene" and "obscenity" back through the French "obscene" to the Latin "obscenus" we find ourselves not in a brothel, bookstore nor even a courtroom but at a religious ceremony. "Obscenus" means, among other things, unfavorable, ominous, unlucky. Birds of ill omen are obscene because they promise bad luck. Ovid calls the ship which carries Helen to Troy "obscena," not because of behavior on board but because the ship carries the misfortune of Troy. By transference the word also has the Latin meaning of repulsive, offensive, hateful, disgusting, filthy—all in a physical sense. Polluted water is obscene. So are the Harpies, with their abominable table manners.

Today it is the universal judgment that obscenity should be restrained and this judgment is reflected in the international

agreement of over fifty nations, in the obscenity laws of all but one of the fifty states, and in the twenty obscenity laws enacted by Congress from 1842 to 1956.

Pornography, as something to be suppressed by the full force of society and the state, seems to be a modern problem.

There was little or no interest in the suppression of obscene literature in England prior to 1800.

The United States Supreme Court had no occasion to pass on the constitutionality of legislation making obscenity a crime for more than 150 years after the adoption of the First Amendment.

Over the years obscenity has been charged with four possible evils: (1) the incitement to anti-social sexual conduct (2) the psychological excitement resulting from sexual imagery (3) the arousing of feelings of disgust and revulsion and (4) the advocacy of improper sexual values.

Today most authorities believe that obscenity may be regulated because it is thought to incite anti-social sexual behavior and crime; or because like a common law nuisance it constitutes an unreasonably offensive intrusion into the lives of persons who cannot avoid it.

Though the old decisions held that obscenity was not within the area of constitutionally protected speech and press the modern trend is that it is speech within the meaning of the constitution and may not be prohibited by the state unless it may be shown that its dissemination is a "clear and present danger" to society. Under this application of the first amendment a clear and present danger of overt anti-social conduct must be demonstrated before utterances may be suppressed.

This concept may be traced back to John Stuart Mills' *Essay on Liberty* where he said:

"... the sole end for which mankind are warranted, individually or collectively, in interfering with the liberty of action of any of their number, is self-protection. . . . The only purpose for which power can be rightfully exercised over any member of a civilized community, against his will, is to prevent harm to others. His own good, either physical or moral, is not sufficient warrant. He cannot rightfully be compelled



to do or forbear because it will be better for him to do so, because it will make him happier, because, in the opinions of others, to do so would be wise, or even right. To justify that, the conduct from which it is desired to deter him must be calculated to produce evil to someone else."

The people of this country, more so even than the courts, operate on the assumption that reading about sexual matters leads to anti-social actions, particularly to juvenile delinquency.

The rationale for the legal suppression of obscenity and for the imposition of criminal penalties upon those who disseminate obscene materials is built upon the belief that the consumption of obscene matter by children or adolescents has deleterious psychological effects on their development, and leads to anti-social and criminal behavior.

The question of this paper is whether there is any empirical evidence to support any assumption about the effects of any form of communication of obscenity.

The unfortunate fact is that today relatively little information is available on the effect of sex literature on human conduct.

In appraising the actual effect of literature upon the sex conduct of the reader, there is a great deal of talk and very little factual data upon which to base a fair judgment.

Let us examine insofar as it is possible the effects of reading obscenity, and if we can do nothing else, at least dispel the many wrong assumptions that exist in this area.

One scholar in this field has said:

"... that for academic psychologists to speak dogmatically about the psychological effects of reading obscene books would in the present state of our knowledge be as unbecoming as venturing guesses about the nature of the Oedipus Complex in outer space. The truth of the matter is that there are not sufficient conclusive research data available to answer the question directly and with the same assurance as one could, for example, state that unhealthy family life is one of the contributing causes of juvenile delinquency.

"It is amazing, nevertheless, how many people have felt called upon to voice the most authoritative opinions about the effects of 'obscene' writings, including law enforcement officers, educators, clergymen, housewives, women's clubs, men's fraternal organizations—in short, all those who are least qualified to give an authoritative opinion on a subject of such confusing dimensions and such width of scope, but who, because of their own deep emotional involvement, have felt no hesitation in expounding 'ex cathedra' and with omniscient finality on the matter. Among them there have even been a few members of the behavioral sciences, though we can say to the credit of professional groups such as psychologists, psychiatrists and sociologists, who would be best qualified to give such opinions, that very few have ventured to do so."

Everyday, the newspapers carry some release from pro-censorship quarters, blithely linking "obscene" literature with the perpetration of the most ghastly crimes, making anything erotically provocative responsible for every social evil from juvenile delinquency and the disintegration of the American family, to the increasing rate of mental breakdown, and communism.

Let us look at a sampling of the assertion of the basic assumption from several groups and organizations:

#### 1. LEGISLATURE

"Senator, I welcome your support and that of your colleagues in the Senate in this matter which I consider a very, very serious threat and particularly toward our youth; I think there is a direct connection between smut, filth, pornography, and juvenile delinquency."

Rep. Daniels, New Jersey

"The State and local governments have perhaps an even greater responsibility in the exercise of their police powers to protect the public, and particularly minors, from the morally corrosive effects of such matters and materials."

H.R. 7465; S. 309



"Nevertheless, sufficient time was devoted to probing the traffic to the extent that subcommittee members were able to confirm assertions that pornographic literature is contaminating the minds of too many of the Nation's young people and to determine further that the moral and psychological fabric of American society suffers incalculable damage when young people are exposed to pornographic materials in its many aspects."

No. 2381, 84th Cong. 2nd Sess.  
Digest of Senate Report

"The Senate Subcommittee on the basis of letters and surveys taken from police files and law enforcement officers reports to the committee that there was ample cause for their apprehension concerning the deleterious effects of obscene literature on the behavior of children."

Digest of Senate Report  
No. 2381, 84th Cong. 2nd Sess.

## 2. CHURCHES

"We feel that the juvenile crime rate which is sharply increasing just as much as narcotics, venereal disease, and homosexuality among our youth, are due, in large part, to the vigorous promotion of salacious literature. . . ."

Rabbi Dr. Julius G. Newman  
Chairman of the Board, Society  
for the Protection of Children's  
Mental and Moral Health.

## 3. CLUBS

"There is responsible testimony on record from psychiatrists, doctors, mental health people, and others, that this material largely contributes to juvenile crime."

George Davis, Knights of Columbus  
Jersey City, N. J.

"Americans cannot ignore testimony of youth counselors, social scientists who report a significant relationship between salacious literature and increasing crimes of rape and sexual degeneracy."

John W. McDevitt, Supreme  
Knight, Knights of Columbus

## 4. PSYCHIATRISTS AND SOCIOLOGISTS

"Obscene material is an important contributing factor in juvenile delinquency."

Dr. A. M. Ornsteen

"Let us not delude ourselves that pornography is a beneficial outlet for unwholesome sex tendencies. The smut merchants have no medals coming to them; they are not to be regarded as benefactors, or contributors to mental health. On the contrary they are crippling our youngsters by encouraging the expression of their sex impulses in an unhealthy direction."

Dr. Max Levin

"There is a very direct relationship between juvenile delinquency, sex life, and pornographic literature."

Dr. Benjamin Karpman

"Children could be sexually perverted by looking at contents of books. Reading such magazines has something to do with increase in sex crimes."

Dr. George Henry

## 5. MEDICAL DOCTORS

"I am certain that a vast majority of my fellow physicians agree that habitual reading of obscene literature and viewing smutty entertainment, especially by impressionable children and young people, result in antisocial actions. The effect may not be immediate; it may be tomorrow or years from now. That what an immature person reads, sees, ponders and absorbs affects his character, and hence his behavior, is so obvious that it is not open to question."

Dr. William P. Riley, New York City  
Citizens Anti-Pornography Commission

"It is difficult, if not impossible, to prove scientifically that a direct casual relation exists between libidinous literature and socially unacceptable conduct. Yet, it is undeniable that there has been a resurgence of venereal disease, particularly among teenage youth, and that the rate of illegitimacy is climbing. It may be postulated that there is a correlation between these phenomena and the apparent rise in



the sale of salacious literature, and perhaps it is casual, but the latter observation cannot be definitely demonstrated. It can be asserted, however, that the perusal of erotic literature has the potentiality of inciting some young persons to enter into illicit sex relations and thus of leading them into promiscuity, illegitimacy and venereal disease."

New York Academy of Medicine

#### 6. POLICE

"Obscenity certainly plays an important part in our crime picture today, and this statement I make in the light of thirty years of police experience handling every phase of crime in our calendar. It definitely, emphatically plays an important part in our ever increasing rate of crime today."

Chief of County Detectives  
Philadelphia, Pa.

#### 7. TEACHERS

A principal of a leading boy's high school in Atlanta recently displayed certain types of extremely salacious material which he had found in the pockets of his students. When asked what he regarded as the moral result of this material upon the lives of his students, he said:

"This very stuff has sent three boys to the training school."

The man in the street is unshaken in his belief in the direct correlation between obscene literature and crime. The December, 1965, issue of *Reader's Digest*, after setting out examples of sex criminals who were captured with obscene pictures in their possession relates:

"These examples can be multiplied by the hundreds, all indicating a direct connection between the enormous tide of obscenity in publications and entertainment and the alarming increase in delinquency and crime—especially among children and youths."

But most, if not all, of these sources and authorities quoted so far have relied on their personal psychological insights without raising the question of the reliability of their own judgments—hardly any have based their arguments on available research.

The question we must ask is whether there is any empirical evidence to support an assumption about the effects of any form of communication of obscenity. I limit this effort to the empirical investigation and do not consider the opinions, assumptions, or naked assertions of fact about the effect—or lack of effect—or obscene communication. Of course I do not mean to deprecate the importance of getting the responsible opinions of informed and interested people. As one expert has correctly said:

"The law in this field, as in many others, is probably going to operate on intuition if it cannot operate on science. The opinions of psychiatrists, law enforcement officers and other people who have had contact with some consumers of obscenity may well be a controlling consideration. But there is no substitute for reliable, factual information; the opinions of experts should at least be consistent with what scientific knowledge we have; and understanding that scientific evidence should be a matter of concern to those who would preach on what the law ought to say about sex expression."

None of the scientific studies which have been done really answer the big question and all of them point to the need for more research. But if nothing else, they show how complex the subject is and may supply a lesson in humility to those who are opinionated and to those who demand opinions from others.

There are four main categories of studies which have been made in this area.

First the study which relies on subjective reports of sexual arousal. By the use of a questionnaire or interview the research scientist asks people who have observed obscenity to give an introspective account of their feelings. Most studies of this type utilize inmates of penal institutions or children in state training schools. Ramsey in 1943 and later Kinsey have done the most outstanding work in this area. These men and recently Gebhard utilized various stimuli, such as, portrayals of nude figures, genitalia of the opposite sex, commercial motion pictures, burlesque and floor shows, portrayals of sexual action, romantic and literary materials, and erotic stories. They then made reports of the sexual arousal.



The second broad class of tests consists of the investigation of the factors which determine individual preference for psycho-sexual stimuli. An example of this category is the testing of Buchwald in which the subjects' task was to guess whether each successive card of a deck held face down was blank or had a picture on the reverse side; cards being randomly drawn from a deck that contained an equal number of blank and pictorial cards. If the subject responded picture he was shown the reverse side of the card; if the subject said blank he was told whether his response was correct or incorrect but he was not shown the card. Thus the subjects who consistently guess the picture would view all the cards; the subject who invariably guessed blank would see none of the pictures. Another study is that by Miller and Swanson in which college men were given a set of equivalent incomplete story tests and were told to finish them.

The third category consists of studies which are concerned with the effects of sexual stimuli on one aspect of an individual's actual behavior. The investigators are not interested in what the subject says he does under such and such conditions which do not exist at the moment; rather they create a certain condition, for example showing a picture of nudes; they then observe some aspect of the subject's behavior, in this case a fantasy production. One technique is to have a subject tell or write a story about the picture he has seen. Another technique is to show the picture and then give a TAT (thematic apperception test) which also calls upon the subject to tell a story.

The last of the four is the physiological assessment of sexual arousal. This type of study investigated the physiological indices of an individual's response to portrayals of love, nudity and sexual activity. The particular measures utilized range from estimates of prostate gland activity to the galvanic skin response, blood volume and respiratory rate.

The stimuli presented in these tests ranged from depictions of nude females to a photograph of a smiling Japanese decapitating an Australian prisoner.

Certain generalizations can be gathered from all four categories.

"1. A significant proportion of our society is sexually aroused to some extent by some form of sex stimuli in pictures and probably in books.

"2. Portrayals of female nudity and of sexual activity lead to sexual arousal in many males. . . . These materials arouse females far less frequently.

"3. Females, on the other hand, are more frequently sexually aroused than man by complex stimuli which portray 'romantic' or 'love' relationships and which constitute, in general, less direct sexual cues.

4. Males differ among each other in terms of preferences for and response to various types of sex stimuli. Factors which account for different preferences among males for viewing sexually relevant materials include: adequacy of masculine sexual identity, strong guilt with respect to sexual behavior, physical maturity and intellectual ability.

5. The environmental circumstances under which the sex stimuli are viewed may influence the extent to which the viewers will show evidence of sexual arousal. It is not clear, however, whether the failure to observe evidence of sexual arousal is due to the fact that no arousal occurred or that the overt expression of the arousal was inhibited.

6. Exposure to certain types of sex stimuli is, for some persons, both males and females, a distinctly aversive experience.

Of course these basic studies only record the immediate, transient responses of the individual to various stimuli. As we will see, the long term effects of the stimuli have hardly been studied.

Thus, granting that many obscene materials do arouse under many circumstances, we need to know more. We need to know how long the conditions of arousal last and how this stimulation might affect overt behavior, attitudes governing behavior and mental health.

I cannot offer empirical evidence at this time to answer such questions because no such evidence exists. The data simply stops short of the critical point.

In speaking of this second stage which deals with the more lasting effects one writer has said:

"If one insisted on supporting empirical evidence it would be hard to find a rationale for our anti-



obscenity laws which squares with first amendment theory."

Because the government and public in general is vitally interested in conclusions in this area it might be well to mention the studies which have attempted to validly take the second long step. Most of these studies are in the area of juvenile delinquency and are primarily concerned with the role of obscenity.

Glen V. Ramsey, through interview and questionnaire, submitted thirteen specifically sexual stimuli to a sample of boys who belonged primarily to the middle and upper-middle levels of a Mid-Western city with a population of more than 100,000. These were:

- "Seeing females
- Thinking about females
- Sex jokes
- Sex pictures
- Pictures of females
- Females in moving pictures
- Seeing self nude in mirror
- Physical contact with females
- Love stories in books
- Seeing genitalia of other males
- Burlesque shows
- Seeing animals in coitus
- Dancing with females"

Nowhere in this study is there any indication that the boys reacted with delinquent behavior to any of the stimuli mentioned.

No review would be adequate without including the classical study of Drs. Sheldon and Eleanor Glueck, who intensively examined 1,000 delinquent boys from the Boston area. They found basically five highly significant factors contributing to delinquency: 1. culture conflict; 2. unwholesome family environment; 3. educational deficiencies; 4. socially undesirable use of leisure time (e.g., gambling, drinking, drug addiction and sex misbehavior) and 5. psychological defects. Nowhere did the Gluecks mention erotic or any other kind of reading materials as a contributing factor in the causation of delinquency.

In a report by a committee of Brown University psychologists commenting on a series of statements linking delinquent behavior to salacious reading, the conclusion reached was that there is no reliable evidence that reading or other fantasy activities lead to antisocial behavior.

To the same effect is the American Youth Commission's study, the studies of Kinsey, the report of the New York State Commission on Youth and Delinquency and the studies of Dr. Gebhard and Dr. Jahoda.

The most recent study and report of the correlation if any between obscene literature and anti-social conduct is found in the book by Paul Gebhard entitled *Sex Offenders, Analysis of Types*. The Gebhard study was made by personal interview through the Kinsey organization with over 1,500 men convicted of a wide variety of sex offenses. In his book he says:

"With great assurance many persons state that exposure to erotica and pornography leads to moral decay and sex offenses. The axiomatic character of these statements would lead one to the conclusion that incontrovertible scientific evidence had been adduced, either of experiential or survey character, for their support. The present state of confusion in the Courts and Legislatures is ample evidence that the purported casual relationships have not been subjected to any scientific test.

The common presumption is that depiction of sexual activity is a strong stimulus of sexual arousal, and one which not infrequently engenders sexual activity of one sort or another. This presumption is shaken by the discovery that rather large proportions of the men (sex offenders) reported little or no sexual arousal from pornography.

There was no stronger reaction among the sex offenders than among the general public to pornography."

"Summing up the evidence, it would appear that the possession of pornography does not differentiate sex offenders from non sex offenders."

Any analysis of this subject must end with the most authoritative study in the area to date—that of Dr. Marie Jahoda



and the staff of the Research Center for Human Relations of New York University in 1954. This treatise was published by the American Book Publishers Council.

In correspondence with Judge Frank, as summarized in *United States vs. Roth*, 237 F.2d 796, Dr. Jahoda says:

"Persons who argue for increased censorship of printed matter often operate on the assumption that reading about sexual matters or about violence and brutality leads to anti-social actions, particularly to juvenile delinquency. An examination of the pertinent psychological literature has led to the following conclusions:

1. There exists no research evidence either to prove or to disprove this assumption definitively.

"2. In the absence of scientific proof two lines of psychological approach to the examination of the assumption are possible: (a) a review of what is known on the causes of juvenile delinquency; and (b) review of what is known about the effects of literature on the mind of the reader.

3. In the vast research literature on the causes of juvenile delinquency there is no evidence to justify the assumption that reading about sexual matters or about violence leads to delinquent acts. Experts on juvenile delinquency agree that it has no single cause. Most of them regard early childhood events, which precede the reading age, as a necessary condition for later delinquency. At a later age, the nature of personal relations is assumed to have much greater power in determining a delinquent career than the vicarious experiences provided by reading matter. Juvenile delinquents as a group read less, and less easily, than non-delinquents. Individual instances are reported in which so-called 'good' books allegedly influenced a delinquent in the manner in which 'bad' books are assumed to influence him.

"Where childhood experiences and subsequent events have combined to make delinquency psychologically likely, reading could have one of two effects: it could serve a trigger function releasing the criminal act or it could provide for a substitute outlet

of aggression in fantasy, dispensing with the need for criminal action. There is no empirical evidence in either direction."

My belief is that this is the last word that we have from the people who are in the best position to speak.

Research developed some weird and interesting examples of what Jahoda meant by "good" books allegedly influencing a person in the manner in which "bad" books were assumed to influence him. Heinrich Pommerenke, who was a rapist, abuser, and mass slayer of women in Germany, was prompted to his series of ghastly deeds by Cecil B. DeMille's *The Ten Commandments*. During the scene of the Jewish women dancing about the Golden Calf, all the doubts of his life came clear: Women were the source of the world's trouble and it was his mission to both punish them for this and to execute them. Leaving the theater, he slew his first victim in a park nearby. John George Haigh, the British vampire who sucked his victim's blood through soda straws and dissolved their drained bodies in acid baths, first had his murder-inciting dreams and vampire-longings from watching the 'voluptuous' procedure of —an Anglican High Church Service! Albert Fish, who has been called the most perverse case known to psychiatry, decided he had a mission to castrate small boys and offer them as human sacrifices to God as a result of reading the Old Testament.

Some recent articles have very persuasively asserted the pornography instead of causing sex murders and other criminal acts, may be more often than not a safety valve for the sexual deviate and potential sex offender.

It is my view that the popular misconception referred to in this paper largely comes about as a result of pornography being regarded by the public as uniform in its style and effect. There is no uniformity to pornography. What reformer would forbid stocking advertisements? Yet, certain fetishists dote upon the illustrations of women's sheer stockings in the general mail order catalogue and a certain sub-group of specialists concentrate upon those in a catalogue for stout women. Even in what moralists regard as harmless comics, the abnormally functioning take sexual pleasure. Certain comics, in which an older, accomplished man shares his life with an adolescent boy, constitutes material for wish-fulfillment dreams of homosexuals.



Other comics, in which young career girls share in a circle composed of older aggressive career women and in which men appear in recessive roles, provide fantasy material for Lesbians. Sunshine and Health, probably the least erotically stimulating magazine published—seems far more provocative to moral reformers than the magazines for fetishists that specialize in pictures of women in black net hose, spike heels, high-laced boots, and carrying nail studded whips. Because nudity is absent in the latter and present in the former, the moralist regards his problem as settled. I think there will be more light and less heat when this misconception is overcome.

Let me conclude this paper, with the opinion that further research on the basic question is essential if our obscenity laws and the prosecutions under them are going to rest on a rational and at least semi-scientific basis. There must be an investigation to determine if there is a casual relationship between the reading or the viewing of material dealing with acts of sexuality or sexual deviations and perversions and the commission by readers or views thereof of criminal or other anti-social acts. We must admit, as of the present time, that none of the literature pertaining to the subject can be said to be conclusive on the question as to whether reading pornographic material causes social unaccepted behavior.

The research should begin by clarifying the assumptions made by different individuals and groups as to what constitutes obscene or harmful literature. The study should ascertain what various groups of the population regard as obscene or otherwise objectionable in literature and these views should be related to other dominant values held by these groups and to the experience of the members. It is clear that the present level of knowledge about the impact of various kinds of literature does not provide a basis for a meaningful, legal definition of harmful literature. While there seems to be a general, scientific consensus that reading cannot constitute a major casual factor, evidence on this point is scarce.

In conclusion I am pleased to say that just such an objective study is on the horizon. The Honorable Fred M. Vinson, Jr., Assistant Attorney General of the United States in the Criminal Division of the Department of Justice in testimony before the Congress offers immediate promise. He reports:

"I am pleased to say that the Department of Justice has done more than merely perceive a need. At the present time, we are exploring with the Department of Health, Education and Welfare a proposal for conducting a scientific study on the effects of obscenity. It is our hope and our intention that this joint exploration will lead to a thorough consideration of the problem; for we recognize that only through painstaking research can be obtained useful scientific results. The study we are planning will be a long-term effort, but a necessary one."

I believe that something worthwhile will come out of this study.

Then we will be in a better position to know whether the publication of a magazine such as *Eros* presents a clear and present danger to our society. Then, and only then, we will know whether justice and reason require that its publisher be confined to prison for five years time and subjected to a fine of \$28,000.00.



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## HI-FI AND STEREO: SOME RAMBLINGS OF AN ADDICT

C. LAMAR WALLIS

Read Before "THE EGYPTIANS," March 17, 1966

Shortly after World War II my wife went to the telephone one afternoon in our Texas home to answer a call from the city's best assembled, blonde divorcee, who wanted to extend an invitation to the Wallises to come to her home for dinner on Saturday evening. During the conversation this blonde member of a nearby large symphony orchestra volunteered the hope that Lamar would get a chance during the evening to look at her "tweeter"!

Now this rather harmless observation came in the early days of hi-fi before my spouse had become conditioned through long suffering to the language of hi-fi nuts, and the fact that the remark came from a glamorous and much discussed musician currently living with husband number three, four, or five (I forget which) may explain to the uninitiated the sort of situation I encountered upon going home from work on that memorable day. "What is a tweeter?" was the predictable question which exploded in my face at the front door, followed quickly by "Just what do you think you're going to do to Mrs. Blank's thingamajig or whatever you call it?" I count my full-fledged entrance into the high fidelity music field from that date.

The scene of my first encounter with this albatross really dates back earlier than the day of the fatal telephone call to a Sunday afternoon when one of my fellow choristers persuaded me to accompany him from church to his bachelor's apartment to hear some "special" kind of records. I shall never forget the shambles which greeted us when he opened the living room door and proudly displayed what he termed his "hi-fi-rig." Wires were strung in great profusion all across the floor, under the rug, and up the wall, and various unpainted plywood crates of dubious workmanship were piled upon each other around the room. In one corner a monstrous box almost as high as a man's head shrieked with gaping mouth at a phonograph disc spinning merrily away atop an orange crate in the center of the



rug. Everywhere there appeared to be numerous radios apparently left out of their cabinets with rows of tubes glowing fiendishly. It was a bewildering sight.

My electrical engineer friend happily acquainted me with this "new sound" as he babbled endlessly of amps, preamps and dampers, of Bogen, Garrard, Klipsch, Fisher and McIntosh, of pickups, styli, feedback, resonance, equalization, frequency modulation, compliance and compensation. I went home in a state of shock, but from that day my brand new phonograph took on a tinny sound which it was never able to overcome in its short lifetime.

The beginnings of high fidelity music reproduction date back before World War II when engineers and experimenters began to try ways of improving the sound of recordings played over public address systems on the wretched turntables provided to attract the crowd's attention before the talking began. The P.A. system planted the idea of separate components for reproducing sound—the record player, the amplifier, and the loudspeakers. It was only a short step from there to the first hi-fi systems with their vastly improved component parts in the 1940's. But between that short step of pre-World War II days and the highly sophisticated listening equipment of today lies a period of remarkable scientific refinement of the art of reproducing sound.

My earliest memories of the phonograph go back to what I calculate to have been my third or fourth year upon this earth. A neighbor (the only neighbor within half a mile of our farm house) bought a strange little machine with a morning-glory type metal horn attached to a steel needle which moved in tiny grooves along a wax cylinder. If this machine were kept tightly wound, it would emit screeching sounds which, I recall vaguely, told something about a man named Uncle Josh, who seemed to have been chased up into a tree by a grizzly bear. At this point my memories of these earliest days fade out, but I do recall how, a few years later, my uncle used to waltz around his parlor floor to somewhat better sounding music from a Victrola played on flat disc records, each of which informed the reader of the label that the tune was a "fox-trot" or a "waltz" (at that point I do not recall the use of the term "Charleston," but no doubt it was abroad, also). Some of the

records were quite heavy and printed on one side only; but, alas, I do not recall having seen in those years any of the old one-sided Caruso discs! John McCormack, yes, but not Caruso.

The road from Uncle Josh on the Edison cylinder to Artur Rubinstein on today's stereo disc or magnetic tape is a long one, and every inch of it is fascinating to the dedicated hi-fi and stereo buff. The time limit here this evening will spare you a step by step account, but I cannot let this captive audience escape without a few remarks on the development of the phonograph record, frequency modulated, or FM, radio, and magnetic tape.

The first giant improvement in phonograph records came with the introduction of electrical recording in 1925. Up to that time the artist had been compelled to stand in front of an enormous horn and sing or play into its cavernous opening, depending upon the natural acoustics to wiggle the recording stylus sufficiently to cut the sound into the master from which was pressed the shellac record. With the advent of electronic recording came amplification of the sound by means of vacuum tubes, and a greatly improved quality was added.

Up to 1948 the speed of the home phonograph record was 78 revolutions per minute giving just enough time on one side of the disc for a popular song. In June, 1948, Columbia Records revolutionized the record industry with the "long playing" record. RCA brought out a rival disc that turned at 45 rpm but Columbia won the major battle in the war, leaving the 45 rpm record mainly for pop music today. The serious hi-fi and stereo enthusiast concentrates on the 33-1/3 rpm record—so much so that an occasional higher quality turntable is manufactured to run only at that speed.

The 33-1/3 rpm record has proved itself most satisfactory for the world's serious music, so it was only natural that stereophonic music was also recorded at this speed. Again, our time limit blessedly spares you a long dissertation on what stereophonic sound is and how the components of the stereo system operate. While experiments with binaural listening, a forerunner of true stereophonic listening, were carried on back in the 1940's, today's stereo sound was not available to the general public until 1957. Its invention has brought an even finer quality to reproduced sound, and no doubt many refine-



ments will be added as the years go by. By way of summary, stereophonic reproduction is based upon the scientifically determined fact that the two ears are directional in their hearing. At frequencies around 310 cycles per second and higher (about D sharp above middle C) the short wave lengths of sound do not bend around the head as they do in lower-pitched tones; therefore the sound from one side of a person reaches his opposite ear at a considerably decreased intensity. In simpler language, sounds are louder to the ear nearest them. Stereophonic recording and reproduction provides two or more sounds from as many directions. Microphones are placed on either side of the symphony orchestra, and perhaps in the middle, also, and these separate sources are aimed at the listener through separate amplifiers and loudspeakers. Thus, at least two of the old monaural systems (often referred to now as "hi-fi's") are required to give a right and a left channel while the better systems now sometimes supply a third, or middle, channel. When these systems of components are working properly, the effect of stereophonic sound is one of greatly increased realism. It goes without saying, however, that a good, almost distortion-free monaural system is far better than a poor, cheap stereo system; but when the systems are anywhere near equal in quality, the stereophonic one will out perform the single source system by far.

FM radio brought an entirely new range of listening pleasure to the audio world, when E. H. Armstrong, America's great radio genius, invented it and set up the first FM station in 1933. Until that time radio listening by AM was limited to sounds from 30 to 5000 cps. The new frequency-modulated radio signal was capable of carrying sounds from 30 to 15,000 cps; and since it was also static free, it brought into the home a sound almost as good as that heard in the studio. Then in 1959 the introduction of FM multiplex, a system of carrying the two sources of stereo sound by FM radio, made it possible for the home listener, if he had the proper stereo receiving and amplifying equipment, to hear stereo sound from a recording or live music played in the broadcast studio. Incidentally, Memphis is pathetically behind the times in stereo broadcasting.

Like many other developments in the faithful reproduction of sound, magnetic tape recording grew out of World War II.

When the Allies captured Radio Luxembourg in 1944, they found a huge tape machine which far surpassed the phono disc in sound quality. It was brought to America and improved rapidly. First wire and then paper tape coated with iron oxide was employed. Now the use of plastic tape has become an everyday operation and bids fair to replace or compete on equal terms with the phono disc in the near future. Tape is also used to reproduce television images, and the day of the video tape recorder for the home is almost upon us (some models are now available but at rather steep prices as compared to audio recorders).

The magnetic tape recorder is a part of the hi-fi and stereo enthusiast's system of components, for at best it reproduces sound with higher fidelity than the disc. Pre-recorded tapes are quite common now, although slightly higher priced than records; and the satisfaction of recording from FM multiplex or phono disc adds greatly to the joys that are a part of the stereo buff's life. I shall resist the temptation to stray off at this point into the old argument as to the legality of such home recording, much as I would enjoy indulging in this phase of stereo insanity.

Before putting my head on the chopping block by volunteering some guidelines for setting up your own home stereo system (this is a subject which easily arouses the worst in stereo bugs), this seems a good place to discuss some of the major points of contention among the followers of this cult. One of the great controversies that has raged in the hi-fi world within the last ten years is the argument over whether high frequencies are necessary. Today's sound amplifier, if properly engineered, can with ease reproduce sounds at frequencies well beyond 20,000 cps. The school of audio buffs which says such a range is unnecessary points out that human hearing has generally been held to be limited to 20 cycles at the bass end and to about 10,000 to 12,000 cycles on the high end of the spectrum. Dr. F. A. Kuttner, musicologist, maintains that the world's professional musicians can hear only three partials of Richard Strauss' fabulous violin *g*<sup>(4)</sup> (beyond the violin's keyboard) at 3,136 cycles fundamental frequency, or 9,408 cycles.<sup>1</sup> Why, then, Dr. Kuttner wants to know, is it necessary to build amplifiers that go to 20,000 cycles and beyond?



While musicians have disliked the high frequency range from the start, no less an authority than Victor Brociner, well known engineer for H. H. Scott, Inc., says this month in *Radio-Electronics* magazine that "it is neither necessary nor desirable to design an amplifier to cover a much wider band" than the audible range of frequencies, which he defines as 16 to 20,000 cycles. He points out that only young people can hear 20,000 cycles, while older persons hear much less. He also makes the point that the best recording equipment is limited to a range of 16 to 25,000 cps and thinks it undesirable to build amplifiers which exceed very much these limits in their performance.

On the other hand, Robert E. Furst, Harmon-Kardon's engineering vice-president, in the same article challenges Brociner's view. "Even if the ear cannot hear below 20 (cps), it is not the only organ of the body that responds to sound phenomena. The human skin functions as a diaphragm and responds to subsonic tones." And to the argument on high frequencies he responds that the brain is able to perceive sound phenomena above 20,000 cycles. He goes further, also, to point out that limiting amplifier response introduces phase distortion in the remaining radio spectrum.

Thus the old argument goes on. Personally, I have never been among the audiophiles who seem to derive a certain ecstasy from sitting with a high compression tweeter horn bombarding their ears with piercing high notes. Maybe it is because my own hearing falls off somewhat before the average man's, and now in my old age I have lost the hearing of moderately high frequencies altogether in the left ear. It was just the other night that I discovered this physical defect. With my left ear turned to the high frequency horn I heard only silence and concluded that the driver had burned out for a second time, only to turn the other ear to the speaker and hear unmistakably the hissing and piercing sounds above the 6,000 or 7,000 cps range. This is a sad discovery for a hi-fi buff to make, for it means a slight loss in musical enjoyment; but, more importantly, it is a sure sign that the years are rolling on. As for the extremely low frequencies, I take less pleasure in them than in the early hi-fi days, for now that I have proved that my equipment can reproduce them, I must admit that they are

not very pleasant and are more a physical movement or vibration than a sound.

Another subject which will touch off a quick response among the enthusiasts is the matter of the power rating of amplifiers. To go very far into this matter would take us into a more technical discussion than I propose to follow tonight, but a few observations can be made without the textbooks. In the early days of hi-fi 10 to 20 watts of audio output were considered quite sufficient for average high fidelity reproduction, while today the 35-watt per channel amplifier is quite common, and many go to 50 watts and more. Since average room listening requires about 1 to 3 watts at the most, there was once quite a bit of questioning of the need for extra power. This question is no longer so controversial, since it is recognized that the newer high compliance, acoustic suspension speakers require around 25 watts per channel for proper performance. It is also well known that proper reproduction of peak passages in music, such as a loud cymbal clash, will often require much more than double the audio power output for the normal portions of the music. The advocates of plenty of reserve power have apparently carried the day, but it is still a fact that a well designed amplifier with 20 watts for normal audio output per channel will give much pleasure for home listening.

The real controversy over power rating came over the standard for reporting the power output. Most of this controversy came over the entry into the high fidelity field about ten years ago of the "packaged" units marketed by the mass producers of the radio and TV industry. Extravagant claims were made to an unsuspecting public, and still some of this kind of advertising persists, even though the industry has adopted standards and tried to clean up its image. It was common in the 1950's to find amplifiers in packaged units (those built into one cabinet containing record player, radio, amplifier, and speakers) claiming the rating of the peak response rather than the normal power response. Even these peak responses were extravagantly presented. It was not unusual to see a high priced console unit claiming 120 watts of radio output, when it probably would not have performed nearly so well as an honestly designed 20-watt custom amplifier.

Even today the buyer must beware of the rated power output claims of some packaged units, for they seldom give any specifications as to distortion, which is the true measure of the



quality of the sound. A 120-watt amplifier with high distortion playing through a poor speaker system will turn out worse sound than an amplifier of much lower power rating but with a negligible amount of distortion and a carefully designed speaker system. The only sure test is to listen to each under conditions as close to your own living room as possible.

Aside from amplifiers, loudspeakers probably give the stereo perfectionist the most concern. Stories of the aficionado and his loudspeaker systems are legend. There are always the cartoons showing the super high frequencies snapping the stems of the wine glasses held high by the startled guests. And one cartoon I remember showed an entire house as a giant loudspeaker with all of the admiring neighbors gathered around. The Britishers used to build their loudspeaker enclosures with space between the inner and outer walls which they filled with sand to prevent unwanted resonances from developing. Some even made their enclosures of concrete. No golfer trading putters many times a year can hold a candle to the hi-fi nut who has not yet found the loudspeaker with just the right amount of crispness in the highs, the proper brilliance in the mid-range, and the cleanness in the bass. Writing as a "hi-fi wife," Eleanor Edwards says, "While he may realize logically that he can't afford an expensive speaker, his ears will never be satisfied with a cheaper one. . . . You will just get used to the size of the two-way corner horn, when he will blandly announce that he's thinking about making it a four-way system, reaching to the ceiling."<sup>8</sup> Mrs. Edwards advises other wives to contract a mild care of hi-fi-itis: "This will enable you to bear with cheerful mien the construction of a coffin or outhouse type of speaker enclosure in your living room and to look with pity upon the untutored guest who finds its appearance appalling."

In the late 1950's the introduction of the acoustic suspension cone speaker brought the size of loudspeaker enclosures down quickly from the massive units which sat in the corners of many fashionable living rooms of America. With the new high compliance cone almost the same bass could be obtained from the bookshelf size enclosure which formerly came from the monsters standing nearly five feet high and three feet wide. But *High Fidelity* magazine reports that "the magnificent monsters" are returning—though not with a rush.

I still recall how that big Klipschorn glared at me in my first encounter with hi-fi in the late 40's. It is still being marketed in an improved version by that eccentric genius at Hope, Arkansas—Paul Klipsch. A still larger unit, but of a different principle entirely, is now marketed by Acoustech (72 inches high) and by KLH (70 inches high). For the perfectionist, the Acoustech costs \$1,690 plus \$249 for preamplifier for each half of the stereo system, while KLH is \$1,140 for the pair. The Klipschorn is about \$1,000 for a pair, while one of the best of the small, acoustic suspension type is approximately \$450 for two. Most of the large systems range from \$600 a pair upward.

Before our time runs out I must give you some free, unsolicited advice about beginning your first stereo system. This is something which every buff loves to do. As a matter of fact, the greatest problem you will encounter in this whole business (I assume, as do all audiophiles, that you cannot resist taking up this hobby) is the free advice which the enthusiasts will heap upon you at your every move. You might as well begin now to cultivate a tolerant spirit.

So, first, we call your attention to background reading in the field. Libraries abound with books on the subject, but the audiophile finds magazines and catalogs more fascinating. My own favorites over the years are *High Fidelity*, *Electronics World*, *Hi-Fi and Stereo*, *Audio*, *Radio-Electronics*, and a recent newcomer, *Stereophile*. Most of these not only have reviews of new equipment but also review records and tape. They carry articles on music and musicians, as well as on the technical aspects of the field, and they vary in difficulty for the beginner, but most have something for the newcomer.

Much of the pleasure in being a stereo bug is derived from perusing mail order catalogs. One of the marks of the hobbyist is that he has piles of these stashed away in every corner and can quote you the sales prices on all sorts of outlandish bargains in surplus equipment and closeouts. Many of these catalogs are handsomely printed and create in the enthusiast untold yearnings for new and better components. Two of the best of these are Allied Radio of Chicago and Lafayette of the New York and New Jersey area. Some flyers come through the mail in almost illegible mimeographed sheets, and each of these spurs the buff to a new search for something for nothing.



Once the field has been studied a bit, the next step is to visit a reputable dealer in high fidelity sound equipment. The yellow pages carry just such a classification, but it is advisable, at first, to rule out the general furniture, radio and television stores until you have first made the acquaintance of the true high fidelity shop. Otherwise, you may get hooked with something that sounds much better than your old phonograph but which is still far from the real article. In other words, don't go for a popular brand, packaged unit until you have first spent considerable time listening to custom components in an audio shop. After that, you can make up your own mind, for you then have a frame of reference.

Ask the dealer to demonstrate the various amplifiers, record players, tuners, tape recorders, and speakers. He'll be delighted for you to browse and listen. He has developed a remarkable tolerance for the hobbyist, for, like the golf pro shop owner, he knows that sooner or later you will be hooked and may become one of his best customers. Most dealers like to talk about audio equipment, records and tape. You'll learn a great deal from them, and if you are observant, you will learn that they have decided biases and that these seem to run along the lines of the equipment they happen to sell. This is no new phenomenon in the merchandising world, as anyone will agree. By and large, hi-fi dealers are an honest lot and above average in wanting to please their customers. Stay away from radio and television repair shops, for they are marketing a low-fi product, generally, and are too busy with the booming repair field to talk hi-fi and stereo with you.

The veterans will tell you to build your system at little at a time if your budget is an important item with you, but all will advise you to buy a quality component when you do make a purchase. The reason is simple, but hear it from the "hi-fi wife": "Fortunately, I learned this lesson early in my hi-fi life. We have in our attic several pickup arms which were acquired in the process of trying to avoid buying the one we couldn't afford—meaning, naturally, the one now incorporated in our record-playing setup. Now, when it becomes apparent that we need a new part, my vote goes immediately to the best we can find. I've kept no record of the money thus saved, but over the years I'm sure it has amounted to hundreds of dollars."<sup>4</sup>

If you have any curiosity at all and a love for tinkering, I recommend that you buy one of the better kits and build your own amplifier and tuner. Even if you do not love tinkering, it will not be very difficult, and it will save quite a bit of money. For example, the Dynakit components are rated right up at the top with the expensive components, and yet they can be put together by someone who never picked up a soldering iron. So can the other well-known kits. The building of it is half the fun, but I am a confirmed tinkerer, so you will have to view my recommendation in that light.

The recent introduction of the so-called solid state components has simplified your problem in gathering your parts for the system. The transistor has made it possible to design amplifiers, preamplifiers, and FM radio tuners all on one small chassis, a feat which only a year or two ago was thought of as the second best solution for the components. Today's "receiver," as it is called, is no longer than 15 inches, is less than a foot wide and only 3 or 4 inches high. It is being combined with the record player in small table top or bookshelf cabinets, leaving only the speakers separate as they belong (beware of speakers mounted in the same cabinet with the record player unless insulated from the cabinet so as not to return their vibrations to the record player's pickup). This year and next will see a greatly improved styling in the receiver, so that it will become acceptable to the most fastidious housewife.

You will be wise to do a great deal of listening before you make the choice between the smaller speaker units and the large ones. If you have large rooms and like full sound, you may want to go all the way with the larger enclosures. Let your ear and your pocketbook tell you which road to take.

Thus far I have avoided the subject of turntables, pickup arms, cartridges and styli, for this is a field, now that stereo is upon us, which could furnish two or three evenings of argument. Suffice it to say here that the true perfectionist scorns changers and puts a considerable amount of cash into the turntable, the arm, and the pickup. Improvements are being made almost monthly in the pickup cartridge and needle, and they can cost a pretty penny. Here I advise caution in buying the most expensive. Changes are so rapid and the differences in sound quality so minute that I prefer to stay with a good standard cartridge of moderate price and smile indulgently



while the purists battle it out. The audio and consumer magazines carry regular ratings on the cartridges, and I advise you to watch these from time to time.

Once you have found the kind of sound you like and have set up your system at home, there are further precautions you must take. First, you must realize that you have succumbed to a malady that is incurable. It has dangerous side effects, which, if you recognize in advance, can be avoided in some instances. The "hi-fi wife" calls it "a mild form of insanity." She points out that an otherwise miserly husband will blow the entire household budget on some new speaker or pickup or crossover network. She goes on to another symptom: "Time was when your husband was the most solicitous of hosts, no doubt, always mindful of his guests' comfort, and brimming with tact. But now! He will invite his friends to spend the evening listening to music, and will bombard their ears with the loudest sounds he can muster (regardless of the wincing their poker faces may fail to disguise). He will rudely shush the slightest flow of feminine conversation, although a few moments later he will join the other men in drowning out the music with a bellowed dissertation on distortion, hum, or feedback. When visiting a fellow-victim of this strange malady, he will take sadistic pleasure in pointing out any flaws in the system which his host had heretofore found satisfactory."<sup>5</sup>

The mania reaches its worst stage in the test-record phase. Actually, the test record, where a voice drones out numbers followed by a sustained note corresponding to the number of cycles announced, is one of the poorest ways to test a music system, for the ears often hear other than the primary sound. Yet most dedicated buffs are great believers in this method of checking their system and will sit for hours listening to the solitary, monotonous tones. Mrs. Edwards writes: "The hi-fi's in our neighborhood pooled together to buy a test record; I can always tell who is currently using it by the wild look in the wife's eyes and the morose expression in the husband's."

My advice to you is to concentrate on the beauty of the music and resist mightily the temptations to stray into the byways of listening to sounds for the sounds' sake or of becoming too engrossed in the technical aspects of the hobby. I am not, I confess, a very good example to hold up before you, for, alas,

I strayed. Without even a high school course in physics behind me, I fell headlong into the pit of curiosity about the technical side of hi-fi. I never really had a chance, for two of my best friends were electrical engineers interested in the hobby, and my next door neighbor made his living as a communications chief. It was a case of being hooked early and not enough backbone to shake the habit.

Now when I have a spare moment I spend it in my workshop with soldering guns, capacitors, tubes, resistors, transistors, and a maze of hookup wires and test probes. In its later stages now the mania has driven me to watch unashamedly while naked waveforms dance across an oscilloscope screen or to hunch over a workbench for hours pursuing the elusive troubles that afflict television sets and amplifiers and tuners. When I have time to read, I do not pursue the American novel as any self-respecting librarian should do. Instead, I slink away to revel in the literature of transistors, tubes, and television, of audio components and square wave generators, sine wave generators, RF signal generators, vacuum tube voltmeters, and oscilloscopes. It is a sorry, sordid affair, and I feel cleaner for having confessed it here in this open company.

To conclude these ramblings, allow me to be serious long enough to defend the high fidelity music system against those who maintain that only live music in the concert hall is worth listening to. It is true that a highly sensitive system will pick up the unmusical grunts of a Pablo Casals and amplify every imperfection in every record groove, but it is this same sensitivity that will capture for home listening the subtle orchestral shadings of an Erich Leinsdorf. While there are always a few real nuts in every group, most audiophiles are also lovers of music in the concert hall—and are probably better prepared to listen than those around them.

The editor of *High Fidelity* writes of composer Benjamin Britten's Aspen speech of 1964 in which Mr. Britten said: "It is one of the unhappiest results of the march of science and commerce that this unique work (Bach's *St. Matthew Passion*), at the turn of a switch, is at the mercy of any loud roomful of cocktail drinkers . . . the loudspeaker is the principal enemy of music . . . it is simply a substitute . . . Music demands . . . some preparation, some effort—a journey to a special place, sav-



ing up for a ticket, some homework on the program perhaps, some clarification of the ears and sharpening of the instincts." While hastening to admit that there is too much music in the air today and "that recorded music is no substitute for the live experience," the editor makes a good point for the proper kind of listening at home, where time is set aside for it and the libretto and score are brought out if needed.

For this kind of listening we can all be grateful that the phonograph has progressed beyond the days of Uncle Josh on wax cylinders. Today's high fidelity music reproduction is still not the experience of the concert hall and probably never will be, but it comes reasonably close and is the next best thing to attending the concert itself. Take it from an old, confirmed addict, home listening can be fun!

<sup>1</sup>Kuttner, Dr. F. A., "Are High Frequencies Necessary?" in **The High Fidelity Reader**, edited by Roy Hoopes, Jr., Hanover House, 1955, pp. 150-157 (a collection of articles from **High Fidelity** magazine).

<sup>2</sup>March, 1966, pp. 50+.

<sup>3</sup>"I Am a Hi-Fi Wife" in **High Fidelity Reader**, pp. 232-237.

<sup>4</sup>**Op. cit.**, p. 233.

<sup>5</sup>**Op. cit.**, p. 233-234.



**AGING**  
**A REVIEW AND SPECULATION II**

STANLEY J. BUCKMAN

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*Read before "THE EGYPTIANS," April 21, 1966*  
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What has happened since the writer read the first paper of this series before you on March 21, 1963? Has new evidence been developed? Has continued thought resulted in a different interpretation of old evidence? Have there been combinations of these two which support new conclusions?

First, let us consider whether there have been any new theories advanced about the primary basic mechanism causing aging. If so, do any of them meet the following thirteen criteria for testing theories of aging any better than chemical cross-linking?<sup>a</sup>

1. The probability of death increases logarithmically with age, whereas measurements on functional capacities decline linearly with time.
2. Longevity is related to genetic characteristics.
3. Males of most species show shorter life spans than females.
4. Life span can be influenced by changes in diet.
5. In poikilothermal (variable body temperature) animals life span is shortened by increasing the environmental temperature.
6. Exposure to nonlethal doses of radiation shortens life span.
7. The rate of change with age differs among different organ systems.
8. With increasing age, there is a reduction in reserve capacities as indicated by the reaction of the individual (or organ system) to stress.
9. Age changes are greater in total animal (or organ) performance than in intracellular biochemical processes.



10. Age changes increase with the complexity of the performance measured.
11. Loss of elasticity on aging.
12. The theory should be consistent with Szilard's data showing that aging is essentially a random process.
13. The theory should explain the acceleration of aging which takes place in uncontrolled diabetes.

Yes, there are theories in addition to cross-linking which are receiving attention as potential basic causes of aging. However, cross-linking may be involved as a factor in some of the most probable alternates. For example, free-radical lipid peroxidation reactions still may well involve cross-linking as a substantial part of the primary mechanism involved in the formation of lipid-protein complexes. Obviously, such a basic reaction as cross-linking may manifest itself in many ways. Equally obvious is the probability of other contributing causes of aging. It is not the purpose of this paper to consider all of these. In addition to the references cited in the writer's prior paper, Bjorksten and Andrews<sup>1</sup> have reviewed them as has Sinex<sup>11</sup> in a just published paper. In addition, the first volume of "Advances in Gerontological Research" which was initiated in 1964 contains papers reviewing different contributing causes of aging and the way or ways each may manifest itself. Some differences of opinion are apparent and there is some evidence supporting each. It would be amazing if this were not the case, particularly from authors specializing in different disciplines. These very differences will stimulate the search. They will goad these and other workers on and on until the truth is known. This is the scientific process. A lifetime of work with it makes your speaker respectful of that process. However, the current extent of the same lifetime contributes to a desire for some reasonable deductions from the evidence at hand; deductions that point the way to logical things one can do in daily life with a minimum possibility of harm and at least some chance of benefit.

First, you may recall the review in the first paper of this series of the possible use of enzymes to break down the nonfunctional aggregates that accumulate in our cells. As was mentioned, some soil bacteria must have the capacity to produce such an enzyme or we would have accumulated on earth large amounts of insoluble lipid-protein complexes. Bjorksten has correctly

noted that it would not be necessary for the enzyme to specifically break the cross-links which he postulates as the most probable basic mechanism involved in the aging process. It would be effective for the enzyme to break down the insoluble complexes in any way which would reduce them to small excretable fragments.

The use of enzymes still seems to offer hope as a possible approach to the reduction of the amounts of insoluble complexes which has accumulated in our bodies. As such, it is one approach which may enable rolling back some of the aging that has taken place in contrast to other methods which may only retard it from the date of inception of their use. When a suitable enzyme or enzymes are found, there still will be problems of getting them distributed in proper amounts to the cells composing the various organs of the body. However, this should not be regarded as an insurmountable obstacle. In addition, it may be that some way will be found to produce a controlled activation of the cathepsins to the degree necessary to decompose the troublesome complexes and yet not to do irreparable damage to the essential cell components. These intracellular proteinases are responsible for autolysis after death. It is known that they are activated by sulfhydryl compounds and there are numerous sulfhydryl compounds which readily pass cell membranes, such as methionine, cystine, cysteine, and glutathione. Thus, one might hypothesize that administration of adequate levels of sulfhydryl compounds could activate the cathepsin system to hydrolyze lipid-protein complexes. Here again there, of course, is a control problem involved but such is present in many medical treatments. What may seem extremely difficult at the start of work with any new development, frequently will become a matter of routine in a few years. Whether enzymes will provide the way of rolling back aging to some degree remains to be seen. However, one thing seems quite certain; namely, that this approach will be explored along with others by a new company which is in the process of formation under the currently indicated name of Geriatric Breakthrough, Inc.

At this time, it is not known whether the new company will include work with lathyrogenic agents, of which aminopropionitrile is one. Such agents reduce cross-linking, specifically of collagen, and apparently have the ability to break already established cross-linkages at least in the younger col-



lagen. The problem again is one of control so that a beneficial reduction in cross-linking can be achieved and still preserve collagen which is strong enough to properly support the bone and blood vessels. Such an approach would require careful medical monitoring with urine analysis several times a week to check for evidence of collagen decomposition by determination of oxyproline. At least one capable investigator is proceeding with a personal program based on his belief that "It should be possible to find a dose which just slightly slows cross-linking but which does not cause lathyrism."<sup>8</sup>

Next, let us turn to the juvenile hormone. You may recall this is the hormone which prolongs the duration of the beginning stage in the life of insects. As previously stated, it seems to prevent the cytoplasm from receiving or acting on fresh instructions from the coded genetic information in the nucleus. At the same time, it apparently does not interfere with the use and reuse of the information already at the disposal of the cytoplasm. In other words, the presence of adequate amounts of the juvenile hormone causes a cell to read and reread the same period in its life history, but it does not move along to the next chapter.

Dr. Carroll M. Williams of The Biological Laboratories at Harvard still feels as though there are hormones in the human body that are directly related to the aging process. Hormones of the general steroid class likely are the ones involved. However, the specific ones have not been isolated. Moreover, there is no added information to provide increased support for obtaining and eating the fresh thymus glands of young calves, much less pickled human placenta as was jokingly suggested in the first paper of this series. Eating the fresh thymus of young calves still seems to be worthy of consideration by venturesome souls. Maybe another three years will produce sufficient positive evidence to motivate even the most conservative among us. Certainly, the phenomenon of the menopause in women and a potentially related period in the lives of some men well illustrates the importance of hormones and the relation to certain aspects of the aging process.

Again, you might properly ask, "Where do these indications and speculations lead us? What can we as individuals do now about the deposits that are accumulating in our bodies? We do not care whether these deposits are the result of cross-linking or

any other form of insolubilization which also may be involved in deposits such as the cholesterol-containing plaques in our circulatory system. We want to do something now while we are waiting for the enzymes or lathyrogenic agents to break up the cross-linked molecules and the hormones which will stop 'the time clock.' We would prefer something other than pickled human placenta or the fresh thymus of young calves."

Three years ago the following response was given to these questions based on comprehensive assemblies of information by a number of workers:<sup>3</sup>

1. Have a comprehensive medical examination at least once per year, and preferably twice per year, so that prompt corrective measures can be taken to overcome or minimize any indicated problem.
2. Reduce total caloric intake to the minimum necessary for proper body maintenance. This may well be as low as 1500 calories per day for many people above 40 years of age. Total caloric needs decrease markedly with age. Adequate amounts of vitamins and minerals can be obtained by supplementing the diet with a number of readily available vitamin and mineral preparations. The reduction of the total caloric intake will keep down the percentage of Krebs cycle intermediates which are at large and may cross-link with lipids, proteins, and nucleic acids.
3. Maintain a high level of well-balanced protein in the diet. Skimmed milk and dry (uncreamed) cottage cheese are good sources of a well-balanced protein. Maintaining a high protein level will provide free amino acids to react with excess Krebs cycle intermediates and form excretable compounds. A high protein level in the diet also helps insure adequate body repair.
4. Keep total fat intake at a minimum. If substantial amounts of polyunsaturated fats are included in diets, it may be desirable to consider supplementing the diet with vitamin E (tocopherol). Increased amounts of unsaturated fats may result in an increased amount of cross-linking of the unsaturated fatty acids and some of their oxidation products with lipids, proteins, and nucleic acids. Vitamin E



may be an effective enough antioxidant in the human body to prevent or reduce the amount of cross-linking.

5. Exercise daily as vigorously as is consistent with general health. A brisk 2-mile walk or at least 30 minutes of setting up exercises should be standard practice. Excessive amounts of exercise limited to weekends can do more harm than good.
6. Avoid toxic substances in general and particularly smoking cigarettes in excess. Evidence against a pipe and cigars is much less conclusive, but the soundest course probably is to eliminate all smoking. Alcohol in reasonable amounts is not a toxic substance, and there is some evidence that it may be beneficial. The debate on alcohol continues both within and without the medical profession and a good review on this subject appeared in *Nutrition Reviews* for March 1966.<sup>12</sup> Certainly, one should encourage moderation in the use of alcohol.

Most of these suggestions seem as sound today as they did three years ago. Following them will have a beneficial retarding influence on aging for any group of sufficient size to constitute an adequate statistical sample. Moreover, we believe there now are important new additions which can be made, based on the results of recent work and interpretations of information in the literature in the light of this work. These are:

1. Supplement the normal diet with 100 mg. per day of vitamin E (preferably d-alpha-tocopherol acetate which is the most potent of the eight related isomers that exhibit vitamin E activity). This is a general recommendation in relation to the aging process. It does not encompass the use of vitamin E in the treatment of the following clinical disorders for which there seems to be well-founded evidence for such therapy in larger amounts in the case of some of the disorders:<sup>9</sup>
  - (a) Intermittent claudication of moderate severity, i.e., pain in the calf muscles of the leg caused by a definite gap between the demand of the leg muscles for oxygen from the blood and the supply, but a gap which is not too wide to close,
  - (b) Fat malabsorption syndromes, e.g., fibrocystic disease of the pancreas, sprue,

- (c) Supplementation of the diet for premature infants on artificial foods,

- (d) Supplementation of human diets containing large amounts of unsaturated fats.

2. Supplement the normal diet with 10 mg. per day of vitamin B<sub>6</sub> (pyridoxine). Pyrodoxyl phosphate is the active form of pyridoxine and it acts as a coenzyme in the functioning of a large number of enzyme systems, including a wide scope of nonoxidative metabolic changes of amino acids involved in protein turnover. Chow and Yeh<sup>4</sup> of the Johns Hopkins University Medical School have found there is an age-wise regression of tissue levels of vitamin B<sub>6</sub> and B<sub>12</sub> in man. They reported that a mild deficiency of B<sub>6</sub> induced by dietary deprivation raised the pH and decreased the B<sub>12</sub> binding power of the gastric juice. The lack of it reduced the gastrointestinal absorption of vitamin B<sub>12</sub> which could be increased by B<sub>6</sub> therapy but not by coadministration of intrinsic factor. Parallel work with rats on a diet insufficient in B<sub>6</sub> but rich in B<sub>12</sub> eventually developed B<sub>12</sub> deficiency, as indexed by low B<sub>12</sub> levels in the serum and the liver which results in a reduced glutathione content in the erythrocytes and promotes hyperglycemia (elevated blood sugar). A deficiency in vitamin B<sub>6</sub> also resulted in adrenal insufficiency and hypothyroidism (low thyroid). In general, their data showed a similarity between vitamin deficient rats and aging humans. Their old human subjects had the low glutathione and the diabetic type of glucose tolerance test with the implication which the latter has for the further acceleration of aging.
3. Supplement the normal diet with 1 to 3 grams of dl-methionine per day. Uncreamed cottage cheese is a good low-fat, high-protein source of methionine which is present in the amount of about 1 percent of the cottage cheese as received. Methionine also can be obtained through drug stores. This essential, sulfur-containing amino acid cannot be synthesized by the human body and must be present in adequate amounts for the promotion of growth in the young and the maintenance of nitrogen equilibrium in the adult. Methionine alone meets all the human requirements for sulfur-containing amino acids, since the body can convert methionine to cystine



and cysteine. Although methionine has important metabolic functions in the process known as transmethylation and appears to play a specific role in protecting the liver from damage by poisons as well as by its lipotropic action, the supplementation of the daily diet recommended in the foregoing is directed primarily at its relationship to the aging process *per se*. As Tappel<sup>14</sup> has noted in a discussion of the nutritional relationships between vitamin E, sulfur amino acids, and proteins, sulfur amino acids can act as antioxidants somewhat similar to vitamin E. They can react with free-radical intermediates of lipid peroxidation and thereby break the chain reaction. They also can decompose lipid peroxides. If free-radical lipid peroxidation does proceed, the sulfur amino acids thus can protect cellular constituents from damage in both of these ways. In addition, they may serve to reduce already oxidized vitamin E and thereby restore its effectiveness as an antioxidant as well as react in other ways in the molecular repair of damage.

Admittedly, the suggestions given in the foregoing reflect in part some intuitive biochemistry. However, the foundation on which they are based consists of much more than this and even the intuition enjoys multiple support as the following quotations seem to adequately attest:

Bjorksten, a long time exponent of cross-linking as the most likely basic mechanism of aging, has clearly recognized the potential importance of free radicals and oxidation as ways in which cross-linking may be brought about. For example, Bjorksten and Andrews<sup>1</sup> state:

"Cross-linkage due to free radicals generated by ionizing radiation will occur with any large molecules which have reactive side groups, and the amino groups and nucleophilic centers of nucleic acids are fully available for this purpose, as are the corresponding group in proteins."

In another recent paper, Bjorksten and Collbring<sup>2</sup> summarize the results of their work as follows:

"As a model system to study effects of ultraviolet radiation, films were cast of a gelatin-water-glycerin gel to which, in some cases, were added emulsified unsaturated and saturated fats. These films were then exposed to

shortwave ultraviolet radiation and to sunlight. Cross-linkage of the gelatin was measured by determination of changes in melting point of the gel. The cross-linkage was extensive when both radiation and unsaturated fats were present simultaneously. It progressed long after the initiating radiation had been discontinued. The antioxidant vitamin E (tocopherol) markedly inhibited this phenomenon, which is interpreted as evidence that the cross-linkage was caused by an oxidation product formed by shortwave radiation of unsaturated fats."

In two review articles under the subject "Biochemistry of Aging," Sinex of the Boston University School of Medicine comments as follows:<sup>10, 11</sup>

"There is a growing body of evidence, based on findings of an accumulation of pigment believed to arise from auto-oxidized lipid, that auto-oxidation occurs in senescent tissues. It is thought that auto-oxidation proceeds by a free-radical mechanism, with formation of peroxides and of both carbon and oxygen radicals. More attention should be given to the substances which might initiate such reactions in tissue, such as trace metals, hematin, hydrogen peroxide, or oxygen itself. Free-radical hypotheses have the attractive feature of suggesting that preventive therapy with specific antioxidants is a possibility."

"If aging is the result of injury by stray free radicals and peroxidation, such injury might be reduced by a suitable choice of antioxidant, although experience with radiation protection gives some indications of the practical problems in maintaining effective doses of fairly reactive and pharmacologically potent agents over long time intervals. Harman's<sup>5</sup> provocative experiments in which he showed increased longevity through the addition of mercaptans to the diet of mice must be repeated."

Tappel of the Department of Food Science and Technology, University of California at Davis, in an article entitled "Food Lipids and Aging Process" stated:<sup>15</sup>

"Recent biochemical and nutritional research, mainly related to the function of vitamin E, has shown that animals have need of dietary lipid antioxidants in quantities related to their intake of polyunsaturated fats. Fortunately,



the vegetable oils used in our foods are relatively good sources of vitamin E; nevertheless, knowledge of the pathologies of animals on antioxidant deficient diet suggests caution in human dietaries at high levels of polyunsaturated fats. There has developed increasing evidence that the damaging reaction in antioxidant nutritional deficiency states, namely free-radical lipid peroxidation, may also be a basic damaging reaction in the aging processes. . . . Histochemical characterization and recent biochemical studies of age pigments show that they are complex lipid-protein products most likely derived from lipid-peroxidation processes. In general, lipofuscin pigments are best defined as products of *in vivo* lipid peroxidation. Since lipid peroxidation is a random and uncontrolled free radical process, it is apparent that lipofuscin pigments represent damage sites. . . . The comparisons given . . . also suggest that the inhibitors of lipid peroxidation, mainly lipid antioxidants [vitamin E], and those of radiation damage, mainly sulfhydryl compounds [methionine], may be useful inhibitors of aging processes."

Horwitt of the L. B. Mendel Research Laboratory, Elgin State Hospital, Elgin, Illinois, and the Department of Biological Chemistry, University of Illinois College of Medicine at Chicago, from work with humans in the Elgin project supplemented by extensive work on animals, comments as follows:<sup>7</sup>

"It is true that when selenium and/or methionine in the diet is suboptimum, there is a marked increase in the requirement for vitamin E. However, many stresses and other nutritional deficiencies are also known to increase the tocopherol requirement. For example, carbon tetrachloride toxicity, protein, B<sub>12</sub> and folic acid deficiencies and B<sub>6</sub> deficiency, all increase the requirement for alpha-tocopherol. . . .

"The effects of fat, protein, a variety of nutritional deficiencies, rate of growth, age of tissue, and sex of the animal on the many different functions of sex organs, muscle, liver, kidney, brain, and circulatory systems which may be manifested by either biochemical alterations or histological observations of tissue deterioration or pigmentation make for a staggering total of interplaying

variables that would be beyond human capabilities of understanding unless some unifying hypothesis was proposed. The fact that the antioxidant theory has lasted for so many years is a sign of its strength, and the more we work with it the more loose ends it helps to tie together. Indeed, the idea that free radicals in tissues need antioxidants to inhibit the aging of tissues as proposed by Harman<sup>5</sup> is particularly attractive."

Although the foregoing references to vitamin E are chiefly concerned with relationships other than the minimum requirements from the standpoint of the usual deficiency manifestation, such as red blood cell hemolysis, it is interesting to note that Harris and Embree<sup>6</sup> found the computed ratio of the amount of vitamin E (milligrams of d-a-tocopherol) to the amount of the polyunsaturated fat (grams of polyunsaturated fatty acid) was 0.6 for the average 1960 diet in the United States. Based on such a result, they concluded:

"Published data on man and on animals indicate that this ratio is not much higher than that of diets inducing definite symptoms of vitamin E deficiency."

In addition to the probable benefits of a higher intake of vitamin E from the standpoint of some phases of the aging process, there thus seems to be a need for increased intake of this vitamin to merely keep pace with the influence of the television and general communication barrage extolling the "virtues" of polyunsaturates.

You might say at this point, "This is interesting. It also sounds plausible but I still do not have a picture in my mind of what is happening in my cells." To help provide this, it seemed worthwhile to briefly review what some of the more important happenings may be in the light of our individual cells.

Figure 1 shows a schematic diagram of an animal cell with the larger important components indicated. If we start with the cell membrane, we have the first cell structure which may be damaged by lipid peroxidation. As Tappel<sup>14</sup> has noted in a good discussion of the influence of lipid peroxidation, the effect on the membranes of cells and subcellular particles can be very damaging. The action may be as simple as breaking a membrane which it has been demonstrated can be caused by a de-



iciency in vitamin E, the biological lipid antioxidant. Likewise, Tappel and his coworkers have found that the suicide bags of certain cells, the lysosomes, can have their membranes ruptured by exposure to lipid peroxidation and release lysosomal enzymes in the fully active state. Highly significant correlations were obtained between degree of muscular dystrophy and the length of time rabbits were on a vitamin E deficient diet. The study showed that the sequence of biochemical events were: lipid peroxidation damage to cells, invasion of phagocytic cells with their complement of lysosomal enzymes followed by hydrolysis of muscle components leading to muscular dystrophy.

Other functional subcellular particles which may have their membranes subject to lipid peroxidation damage are the mitochondria and the microsomes (portions of endoplasmic reticulum to which ribosomes are attached). As Tappel states, the damage to the membranes of these particles by lipid peroxidation can be profound because of the molecular proximity of lipid and enzymes in the membranes. Mitochondria, the power plant of the cell, contain about 25 percent lipids which consist mainly of unsaturated phospholipids that are structural and functional parts of the electron transport system. The mitochondria are the site of the production of high energy compounds such as adenosine triphosphate. It is apparent therefore that mitochondrial membrane damage can have an important influence on the energy available for the functioning of a cell. This has been confirmed for liver mitochondria of vitamin E deficient rabbits.

Microsomes (ribosome-containing fraction) are subject to as much or more damage by lipid peroxidation as mitochondria because they contain 30 to 40 percent of lipids, mostly phospholipids, and have twice the amount of polyunsaturated lipids on a nitrogen basis as do the mitochondria. Degeneration of the ribosomal function by lipid peroxidation can result in an increased rate of turnover of some nucleic acids, effects on protein synthesis, and decreased ascorbic acid synthesis.

It is hoped that this brief review of some of the damage which lipid peroxidation can cause at the cellular and subcellular level will further encourage you to give serious consideration to the suggested supplements to the daily diet. In the absence of any indication of risk from such a course, one might

say there is "everything to win and nothing to lose." The suggestions are proposed in this spirit and with hope that they may be helpful to some of you and other friends who read them. Your speaker also cannot resist expressing the personal desire that it may be his privilege to supply your untiring interest with a number of additions to the series "Aging—A Review and Speculation." May each addition get us closer to that proverbial "Fountain of Youth" but, failing in getting there, may we enjoy an added increment of usefulness for at least a little longer period of time.

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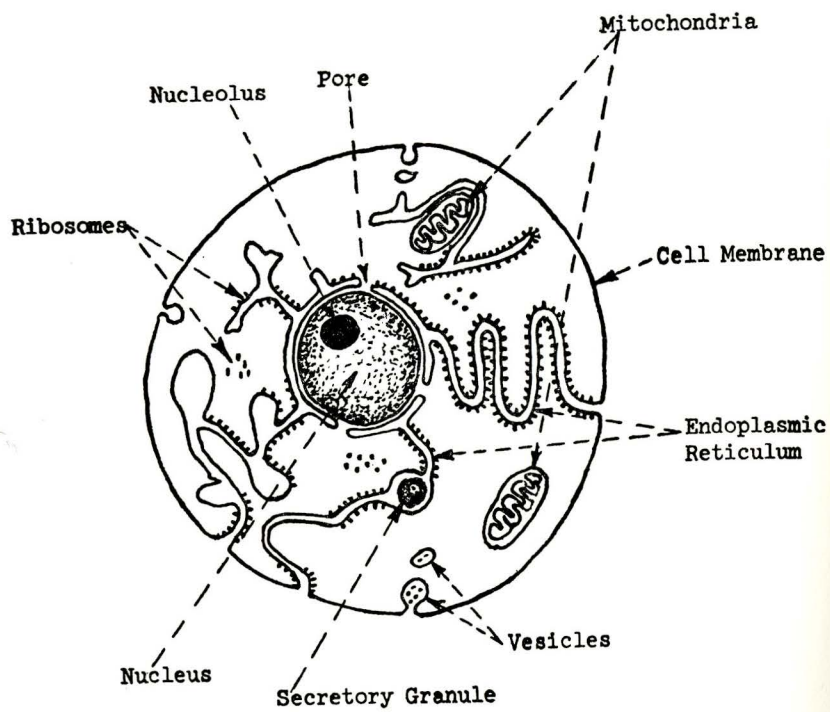


Figure 1.--Schematic diagram of the major components of an animal cell.



## SOLAR ENERGY

HUBERT GARRECHT

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*Read Before "THE EGYPTIANS," May 19, 1966*

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All too often we take the sun for granted, forgetting how totally we depend on its flood of heat and light. It is the sun whose radiation moves the atmosphere and makes our weather and climate. It causes ocean water to evaporate and then fall as rain. It gives us most of our useful energy through coal, oil, gas, wind and water power. It produces our food through sunshine absorbed by plants. We widely use the term "a place in the sun" to describe a favorable or prominent situation.

Scientists agree that the sun is an incandescent body of gases about which the earth and other planets revolve and which furnishes light, heat and energy for the solar system. It is the star nearest the earth, whose mean distance from it is 93 million miles, a length scientists use as the Astronomical Unit for measuring the solar system. The sun's size is such that it could hold 1,300,000 earths, and its mass is 330,000 times that of the earth. It is about 865,000 miles in diameter. Its density is about one-fourth that of the earth. Daylight entering one's window escaped the surface of the sun about eight minutes ago, traveling 186,000 miles per second, but its energy was created deep within the solar furnace before the birth of civilization.

Primitive man thought of the sun as a ball of fire, but scientists long ago determined that the sun was not merely burning like a huge ball of coal. If it were merely coal it would have burned for only a few thousand years and then turned to cold cinders billions of years ago.

In 1925, Sir Arthur Eddington, a brilliant British astronomer proposed the now generally accepted theory that it is atomic or nuclear energy that fires the stars. This energy—the same as that of the hydrogen bomb—comes from nuclear fusion in which the nuclei, or cores, of hydrogen atoms collide, uniting to form helium nuclei and giving off bursts of energy.

Scientists continue: "No other process we know of could possibly pour out such quantities of energy. Moreover, we



know that for the sun to stabilize at its present size, it must have a temperature and pressure at its core sufficient to support nuclear reactions.

"Thus, deep within the sun, each second, 564 million tons of hydrogen are converted to 560 million tons of helium. The remaining 4 million tons each second radiate away as heat and light. If the sun has been shining at its present brightness since the earth was formed nearly five billion years ago, each pound of solar matter must have yielded 4 million kilowatt-hours of energy.

"The sun's power staggers the imagination. In one second, this star of ours (the sun is after all, just one of an estimated hundred billion stars in the Milky Way) radiates more energy than man has used since the beginning of civilization," says Dr. Herbert Friedman, Chief Scientist of the E. O. Hulbert Center for Space Research, U. S. Naval Research Laboratory. "The sun delivers to us in just three days as much heat and light as would be produced by burning the earth's entire oil and coal reserves and all the wood of its forests. Yet earth receives only about one two-billionth of the sun's radiant energy."

"If we could collect and efficiently use the sunlight falling on just the city of Los Angeles, it would supply more energy than is consumed in all the homes on earth."

Study of the sun is filled with startling statistics. At its very center, the solar furnace, 432,000 miles from its surface, has a density about 11.4 times that of solid lead, and generates a temperature of 16 million degrees C. Sir James Jeans, in "The Universe Around Us" calculates that a pinhead of material at this temperature would emit enough heat to kill a man 100 miles away. At its surface, the photosphere—a layer of gas about 200 miles thick—has temperatures of 5700 to 4000 degrees Centigrade. Outside this layer is the chromosphere, a region of flame-like outbursts of gas at temperatures of 4,000 to 500,000 degrees C. Outside this lies the pearly white corona extending millions of miles with temperatures ranging from 500,000 to 3 million degrees C.

"Although the density at the center of the sun must be about 11.4 times that of solid lead, the sun remains gaseous everywhere. The atoms, stripped of their outer electrons by

collisions of atoms, approach each other much closer, accounting for the extreme density, but still free to move about.

"Ninety per cent of the energy that ultimately floods out into space is generated in this central core, and since nearly all its radiation is invisible X-rays produced by nuclear reactions and the collisions of fast-racing nuclei and electrons, the dense hot gas is almost pitch black. The path of an X-ray as it escapes from the core resembles the zig-zagging track of the steel ball in a pinball machine. Even though the rays travel at the speed of light, 186,300 miles a second, the devious trip to the surface takes about 20,000 years!

"During that long period the X-rays gradually change. Each time one is deflected, the frequency of its vibration is reduced slightly, and its wave length is increased. In time, all the X-rays gradually turn into ultraviolet and visible light.

"The peaceful sun can erupt at times with a tremendous burst of energy. Then streams of invisible radiation and immense clouds of solar gas strike the high atmosphere above us. Shielded by a protective blanket of air, our senses receive no inkling of the storm above, but its power shows in a host of mysterious and awe-inspiring events.

"Throughout history these events went almost unnoticed by man except for the spectacle of the northern lights. But with the invention of telegraphy and radio the electrical and magnetic disturbances became a matter of serious concern. Today also, scientists worry about the hazard to man in space if he should be exposed to a blast of solar storm particles. Because of their enormous energy, they can damage and even destroy human cells.

"On November 12, 1960 such a solar outburst took place, and astronomers in Michigan detected a brilliant explosion on the face of the sun. Six hours later, a gigantic cloud of solar hydrogen gas, 10 million miles across and still trailing halfway back to the sun, 93 million miles away, collided with the earth at a speed of about 4000 miles a second.

"Though inaudible and invisible, the collision dissipated more energy in the earth's high atmosphere than the most destructive hurricane, covering every square mile of the globe. It started a violent chain of disturbances on earth, an electrical and magnetic storm of mammoth proportions. Compass needles



wavered erratically, and for hours all long-distance radio communications were blacked out. Teletypes printed gibberish. Airplane pilots lost contact with their control stations, and the Coast Guard could not reach its weather ships in the North Atlantic. For more than a week such chaotic conditions continued while overhead sheets of flaming red northern lights flashed in the sky.

Sun spots form as pores in the midst of the granular pattern of the sun's surface or base of the photosphere. These spots often resemble a funnel four to five hundred miles in depth and several thousand miles in diameter. The temperature of the dark central areas is only about 4200° whereas the surrounding photosphere is 5700° C. These spots are linked by some to behavior of the stock market, to the number of admissions to psychiatric hospitals, to the pattern of annual growth rings in trees. None of these prove out, but sunspots are clearly connected with radio communication, magnetic storms and the auroras—northern and southern lights.

“By use of the spectroscope, scientists measure the magnetism of sunspots. The magnetic field strength is enormous—comparable to the most intense fields produced in modern particle accelerators such as the Brookhaven synchrotron. But Brookhaven produces such a powerful field over only a few thousand square feet. When we consider that the sunspot field often covers an area big enough to blanket ten earths, we know that a major portion of the energy in the solar atmosphere is bound up in magnetic fields. These must come from tremendous electric currents, carrying as much as 10 million million amperes.

“Scientists today hold that the sun and planets condensed from an enormous turbulent cloud of gas and dust about five billion years ago. The sun grew steadily warmer because of its immense gravitational energy. In time the protostar began to glow brightly, and its core temperature rose to millions of degrees.

“Hydrogen nuclei impelled by the tremendous heat, collided with such violence that thermonuclear fusion could occur, and nuclear energy rather than gravitational energy began to keep the star hot.

“As it uses up its hydrogen, the sun's core will move outward where unused hydrogen still exists, the tremendous nuclear

heat also moving outward, causing the sun to expand. Its total amount of radiated heat and light will increase, and the sun will then become a giant red star like Antares. It will blow up to a monstrous ball of extremely rarified, red hot gas large enough to engulf Mercury, Venus, the earth and Mars. This may take another five billion years.

“Finally, when all its hydrogen has been converted to helium, the sun will cool and shrink, ultimately becoming a white dwarf no bigger than the earth but weighing several tons per cubic inch.

Dr. Friedman calls the sun “our bridge to the stars. It is the only star whose surface and atmosphere we can study in fine detail, and it typifies the great majority of stars in the Milky Way. . . . Rockets and satellites will probe ever deeper toward the zones of intense solar activity.”

Such is our sun—or such is our best understanding of it through our best scientists. Its enormous energy beckons a world whose fuel supplies are not inexhaustible, and increasingly we shall solve its mysteries.

The Solar Energy Society with headquarters at Arizona State University at Tempe is the clearing house “for research, development and education in the application of solar energy for the betterment of mankind.” The society sponsors annual International meetings attended by interested people from all levels of interest in the subject, and its library is the only one of its kind in the world.

At the 1965 conference, Mr. L. P. Gaucher, assistant to the Manager of Scientific Planning, Research and Technical Dept. of Texaco, Inc. presented an exhaustive study of “Energy Sources of the Future for the U. S.” In it he forecasts our needs to the year 2200. He estimates our population at 233 million for 1980 and 283 million for 2000; 500 million for 2200.

Energy consumption is directly proportional to the standard of living. The U. S. consumes 10 horse power per person per 8 hour day whereas in Asia it is only 0.1 hp. The U. S. uses 8 times the average for the world.

Others point out that fossil fuels should not be used to supply heat and power alone. These can be supplied by the sun



or atomic fission or fusion. Fossil fuels should be saved as raw materials for the manufacture of many chemicals.

Mr. Gaucher charts energy sources and shows that starting shortly after the year 2000 there will be an energy deficiency which grows to a yearly energy consumption which is greater than the total consumed today. "This energy deficiency may be supplied by fusion or by some source of energy not yet discovered, but at the moment we are inclined to believe that the sun will fill this void" says Mr. Gaucher.

"The sun is the ultimate source of all energy (except nuclear) and it probably would be used today quite effectively to supply all of the energy man needs if our convenient fossil fuels (coal, oil and gas) had not been available. If man's ingenuity through the years had been directed to the utilization of solar energy instead of to the development of devices to consume fossil fuels, it is quite conceivable that we might today have a solar economy just as effective and efficient as our present fossil fuel economy.

"Ultimately man will probably be driven to turn to the sun. When he does, the technological development of new methods for the collection, storage, utilization and conversion of solar energy will be remarkable. Solar energy is uneconomical today simply because it is intermittent and because it is too diffuse when it reaches the earth. But now we are beginning to realize that this energy can be collected and concentrated with satellites and then transmitted to the earth in concentrated beams of selected wavelengths to minimize diffusion and masking by the atmosphere. With such concentrated beams of energy, carefully controlled, solar energy collectors on earth could be reduced to reasonable sizes to make electric power generation attractive. In addition, such directed beams could be used to hasten the evaporation of the seas or lakes, to control rainfall in selected locations, to increase hydropower potentials, to heat frozen areas, etc.

"The total amount of energy that we now consume in the U.S.,  $48.5 \times 10^{15}$  BTU per year, could be collected from the sun by a single satellite collector only 21.5 miles in diameter.

"When this solar era comes, in the next century, most of the energy consumed by the individual consumer will be in the form of electrical energy. We may learn to transmit such energy

through the air without wires, just as we transmit the energy of electromagnetic radio waves today. Perhaps, then, the power plants that are used to generate such power, power that can be picked up with an antenna, will also be located in the sky.

"We are well aware that our present sources of energy cannot last forever, even though they appear to be in sufficient abundance for another two or three generations. We feel, however, that when these natural bounties approach exhaustion, man's ingenuity will rise to the occasion and these bounties will hardly be missed any more than we today miss the chopping of wood, the stoking of coal furnaces and the sifting of coal ashes which a great many of us can remember first hand."

The Wall Street Journal on March 2, 1966 ran a front page story about a tiny firm using a long-known phenomenon called electrogasdynamics or EGD to produce electricity directly from burning fuel. Foster Wheeler Corp. will build with General Public Utilities Corp., an experimental plant. This system would eliminate boilers, turbines and generators, and the need for large quantities of water.

Another interesting concept in this field is called magneto-hydrodynamics or MHD. It utilizes the principle that a gas at 3000° F. or more, becomes a conductor as its atoms break up into electrons and charged particles called ions. Researchers have produced large amounts of electric power by shooting such superhot gas, called a plasma, through a magnetic field.

Both systems suggest use of solar energy because temperatures much higher than these are quite readily produced by concentration of the sun's rays, as in the solar furnace.

Dr. Farrington Daniels of the University of Wisconsin at a symposium several years ago commented: "If I had been asked in 1938 which would come first—utilization of atomic energy or non-agricultural utilization of solar energy—I would have said solar energy. The discovery of fission in 1939 and rapid development of atomic energy show how wrong I would have been. However, billions of dollars have gone into the development of atomic energy and almost nothing into the study of solar energy. If a tiny fraction of the effort given atomic energy were now to be invested in research on the utili-



zation of solar energy, significant progress would certainly be forthcoming.

Photosynthesis is the primary process underlying all agriculture. It is utilized in a photochemical reaction combining water and  $\text{CO}_2$  of the air, with the help of green chlorophyll to form a carbohydrate ( $\text{H}_2\text{CO}$ ). Further, this solar energy is stored in living plants, the oldest and almost the only method of storage of solar energy. On burning with oxygen, the reaction is reversed, giving up  $\text{CO}_2$  and water and 112 kilocalories of heat per gram atom of carbon.

One of the basic facts is that solar energy must be concentrated to be useful mechanically. In 212 B.C. Archimedes is supposed to have set fire to the Roman fleet besieging Syracuse, by using several hundred plane mirrors to concentrate the sun's rays on the ships.

A parabolic mirror 6 feet in diameter with a focal length of 2 ft. concentrated the sun's rays into a small furnace which reached a temperature of 3000 degrees Centigrade. A 34 ft. parabolic bowl lined with flexible mirrors at Mont Louis, France, concentrates sunlight in a solar furnace and focuses the burning rays into a crucible producing temperatures up to 6300 degrees F., which can melt *any* substance.

Geography of course is one of the most important factors determining the practicality of solar energy use. Dark winter or cloudy areas are not appropriate. Arid regions not far from the equator offer the greatest possibilities and these are the very areas which now have the greatest need for cheaper energy. 40 degrees N to 40 degrees S latitude generally offer the best areas.

SOLAR COOKING is the easiest practical direct use of solar energy. In bright sunlight a parabolic or spherical reflector  $3\frac{1}{2}$  ft. in diameter can give heat equal to  $\frac{1}{2}$  or  $\frac{3}{4}$  KW. In Madison, Wisc., it was found possible to bring a quart of water to boiling within 10 minutes, even though there was snow on the ground. These solar cookers are made of vacuum-molded plastic, covered with aluminized plastic, and set in a pipe frame. They weigh less than 20 lbs. and should be cheap to manufacture. A heavier type of spun aluminum was tried in India, but was unsuccessful. \$15 was too high for rural areas in India. Habit and custom are important.

Other types of solar cookers, insulated and with facilities to

store heat, and which can be used indoors and after sundown should come.

In some arid areas, solar cooking would save wood, charcoal, cow dung, labor, and decrease soil erosion, etc.

SOLAR HOUSE HEATING has been accomplished experimentally, storing heat in pebble beds, water tanks, and in chemical solutions. ( $\text{Na}_2\text{SO}_4$ ). In mild climates where heat need be stored only 1 night, this is satisfactory but if several days, auxiliary heating is needed. The roof of a house 33' x 33', an area of 100 sq. meters, receives in 8 hours on a bright day, 500,000 Kilo calories, or 2 million BTU of solar heat, equal to 150 lbs. of coal or 15 gal. of gasoline or 58 KWH of electricity, if produced by a boiler-engine-dynamo system 10% efficient. In areas where heating is now done with wood or shrubs, this might be practical. Long collectors of thin plastic tubes on the roof work well.

SOLAR COOLING AND REFRIGERATION offer opportunities in hot non-industrialized areas. When cooling is needed most, the sun's energy is usually available. Absorption-system refrigeration would work. A 2 ball device for a refrigerator requires exposure to the sun for 2 hours daily. This hand labor would not be accepted in a community where electricity is available.

SOLAR ENGINES cannot compete with gasoline engines and electric motors, but where these cheap fuels are not available, they are possibilities. Heat engines using hot air at different temperatures are possible, but steam engines seem more practical even though they are more expensive. However, in volume it is possible to produce a 1 HP engine for \$50, a movable focusing reflector or heat trap for \$50, and a boiler and accessories for \$50, making a total of \$150. While this is high for the people who would need it, it compares with a bullock or a camel, with no continuing cost of food or fuel.

SOLAR POWER STORAGE is needed for electric lighting a house or village after sunset. The storage of power is even more difficult than storage of heat. The best device for storing electrical power is the standard electric storage battery, but they are too expensive for most solar uses. A storage battery costing about one tenth the price of an automobile battery is a difficult goal to work toward, but the battery need not be small, rugged,



and portable, and need not deliver instantly the very large current needed for starting an engine.

SOLAR FURNACES are entirely practical where high temperatures can be utilized.

SOLAR EVAPORATION of sea water to obtain salt is among the oldest chemical operations. Obtaining fresh water from salt solutions is more difficult, but is being done.

SOLAR STILLs have been operating for years. In Chile since 1870, up to 6000 gallons per day of fresh water has been distilled from sea water. Black troughs with slanting glass covers contain salt water. The water vaporizes, condenses on the glass, and runs off for collection and storage. The cost of glass, troughs and framework is high. Thin plastic blown up into long hemi-cylindrical covers for black plastic trays, promise cheaper possibilities for future production of distilled water. While this process is probably too costly for irrigation, it does promise economic water for drinking and domestic use.

PHOTOCHEMISTRY utilizes the light portion of solar energy and can be made to do chemical work. Most photochemical reactions evolve heat instead of absorbing it, and are thus unavailable for storing energy, or they reverse so quickly that the stored energy is lost even during the exposure to sunlight. The mere fact that photosynthesis exists is encouragement for the hope that other photochemical means of using sunlight exist. Photosynthesis uses sunlight and chlorophyll in growing plants and stores this energy in food or fossil fuel.

Only 0.1 or 0.2% of a year's supply of solar energy is stored in an average farm crop in the U. S. This is less than one-fiftieth of the possible limit, and research here has promise.

PHOTOELECTRICITY is a reality. The Bell solar battery uses a single crystal of highly purified silicon sandwiched between layers of boron and arsenic. It converts 10 to 15% of solar energy directly into electricity without the chemical consumption of any material. These cells are expensive but research should find a way to make them cheaper. A 10 milli-ampere cell at 9 volts formerly cost \$94.50 each in quantities of 100. Already a 15 milliamperes at 9 volts cell retails for \$5.95 each and is being used on transistor radios.

Space vehicles or satellites are perfect examples of applications of solar energy devices. Systems which collect and con-

vert solar radiation into electrical power offer distinct advantages for this use. Research in efficient, light-weight storage of electric power so generated should soon bring results.

In roughly 100 years the U. S. Patent Office has granted some 240 patents pertaining to the utilization of solar energy. The first was issued in 1852 covered a process for bleaching ivory by use of sunlight. They range over all the applications mentioned in this paper and more. Careful study of this list would be interesting and possibly valuable. By rough grouping they classify as follows:

Collectors—flat type air or liquid heaters and boilers. Most are water heaters.

Concentrating devices—includes mirrors, lenses, positioners and accessories. Most are liquid heaters or boilers.

Storage—includes specific heat type and chemical type energy storage.

Engines and pumps—using steam, air, SO<sub>2</sub>, NH<sub>3</sub>, or other working fluids.

Distillers.

Cookers.

Heating systems—heating and air-conditioning; hot water systems.

Miscellaneous—dryers, bleaching devices, thermoelectric generators, therapeutic devices, etc.

Most of the inventors' names are unknown to me though they probably are well known in their fields. My point is simply that any of us here present, given sufficient interest, time and opportunity, might come forward with worth-while developments in this challenging field.